

THE
DISEASES OF THE STOMACH.

BEING THE THIRD EDITION

OF THE

"DIAGNOSIS AND TREATMENT OF THE VARIETIES OF DYSPEPSIA."

REVISED AND ENLARGED.

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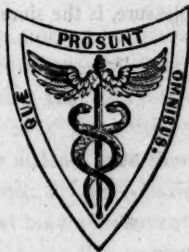
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TO

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PHYSICIAN IN ORDINARY TO HER MAJESTY THE QUEEN,
TO HIS ROYAL HIGHNESS THE PRINCE OF WALES, AND
PROFESSOR OF CLINICAL MEDICINE AT UNIVERSITY COLLEGE, LONDON.

MY DEAR SIR WILLIAM JENNER,

As you kindly permitted me to dedicate to you the First Edition of this work, in grateful recollection of how much I owed to your teaching, I am glad that it should still be honoured by being allowed to bear your name, in memory of your constant and heartfelt kindness, and in thankfulness for an example of the truest devotion to the advancement of medical science, and to the honour of your profession.

That you may long enjoy the honours and reputation so nobly won, and may continue to find in the relief of the suffering of others one of your own chief sources of pleasure, is the sincerest wish of

THE AUTHOR.

PREFACE.

Two editions of the work on which this is based having been exhausted, I am induced, through the kindness of the publishers of Reynolds' "System of Medicine," to present it to the profession in a more complete form, by the addition to it of the articles on Ulcer and Cancer of the Stomach, and also of some minor contributions written for that work.

My original desire in writing on Dyspepsia was to attempt to remove some of the difficulties then existing in the diagnosis of its causes, and to define more clearly the conditions of the Stomach from which the indigestion of food arises; and also to point out the appropriate remedies for each class of these affections.

A consideration of the origin and significance of the various symptoms by which derangements in the functions of the Stomach are revealed formed a necessary part of such an attempt, and this still constitutes the first portion of the present work.

I believe, however, that although Dyspepsia may be considered alone as a symptom, yet a knowledge of all the diseases of the Stomach is necessary to its proper comprehension; and in this sense I trust that the enlargement of the original work may prove more useful than the narrower point of view from which I originally treated the subject.

I have endeavoured to make this treatise as complete as possible, in relation to the numerous researches on this subject down to the present time. I trust, also, that the references to the observations of others may hereafter be of some utility to the students of these diseases, since they may at least save them some literary labour in verifying statements whose origin occasionally becomes obscured by the lapse of time, and may also serve to point to the direction in which further researches on this important subject may be most advantageously prosecuted.

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DISEASES OF THE STOMACH.

PART I.

ON THE GENERAL SYMPTOMATOLOGY OF THE STOMACH.

THE symptoms by which the derangements in the functions or alterations in the structure of the stomach are disclosed are not limited as a rule to any single affection, but are present, with varying degrees of intensity and in different varieties of combination, in nearly all the disorders, both functional and organic, by which it is affected. Their importance as a means of diagnosis requires, however, a separate consideration of the causes of such as are of most common occurrence, especially since they are often the only ground of complaint by patients, and are the cause for which medical assistance is sought. Disorders of the stomach are also characterized by this peculiarity—that their effects may be chiefly, and sometimes solely, manifested by disturbances of the functions or of the nutrition of other and distant parts, whose relation to the original seat of disease is often obscure; and a knowledge of this connection is essential, not only to the diagnosis of the causes of such derangements, but also to the success of treatment directed to their relief or cure.

Many of the symptoms proper to the organ itself are only perversions of its normal physiological functions, a true understanding of which is a necessary prelude to a proper comprehension of the phenomena of its diseases. Although, however, the prosecution of this latter inquiry, in all its bearings, would lie beyond the scope of this work—and indeed, in spite of much modern research, our knowledge even of the physiological processes which are daily performed by it are in many respects as yet only imperfectly understood—yet some allusion to them can hardly be dispensed with.

The semeiology of the stomach may be classified under the following heads:—

A. Limited to the stomach.

1. Objective symptoms, depending on alterations in its size, shape, position, and relation to neighbouring organs.

2. Subjective, consisting for the most part in disturbances of sensation.

3. A mixed class, which are partly objective and partly subjective in their nature, such as flatulence, acidity, eructation, and vomiting.

B. Secondary affections of other organs, which either form part of the gastro-intestinal canal, or have no direct connection with it, the symptoms of which may be either objective or subjective, or may present a combination of both of these.

The questions relating to alterations in the size, form, or position of the stomach, as well as the secondary affections of other organs, will be most conveniently considered under the heads of the diseases in which they take their origin. There are, however, certain phenomena of the latter class, the diagnostic value of which varies according either to their associations with others, or to the order of their sequence, or their relation to other concomitant diseases. Some of these appear, therefore, to merit a special consideration in the following Sections.

ON THE APPEARANCE OF THE TONGUE AS A SYMPTOM OF
DISORDER OF THE STOMACH.

The aspect of the tongue was held by the older writers in medicine to be one of the most important criteria of the state of the digestive organs, and its morbid appearances were therefore carefully observed and minutely described by them as indications for both diagnosis and treatment.

In more recent periods, however, the value of the evidence furnished by this organ has been, if not entirely denied, at least so greatly depreciated, that it seems desirable to ascertain what are the limits of our knowledge with regard to the association of changes on its surface with those occurring in lower portions of the alimentary canal.

The question appears to be capable of being resolved into three principal divisions:—

1. What are the nature and causes of the alterations in the tongue which have been regarded as diagnostic of affections of the stomach?

2. In what other diseases, occurring independently of stomach affections, are these changes observed?

3. What is the nature of the alterations of the digestive organs with which these conditions of the tongue have been found to be associated?

The appearances of the tongue which have been most commonly believed to be associated with the diseases of the rest of the intestinal canal, are (a) an increase of its epithelial covering or "fur," which may present various degrees of thickness, and different shades of colour; (b) enlargement of its papillæ; (c) various shades and degrees of redness of the mucous membrane; and (d) certain alterations in its size and shape.

(1) The fur or coating (*saburra*) has been shown by microscopic examination¹ to consist of epithelium scales, which are often fattily degenerated, and sometimes massed together, of free fat drops, and of confervoid growths; of these the largest proportion is formed of the epithelial cells which are derived from the covering of the organ, together with the saliva and buccal mucus, which in drying form a thick glutinous material, conglomerating the other elements into a mass.

The fur may be of greater or less thickness, dry or moist, uniform, or accumulated more particularly at the posterior portions; it is sometimes deeply fissured by sulci, which may extend into the mucous membrane beneath. At other times it may separate in flakes from the surface, which then may look raw, and of a deeper red than natural, but which may, when the process of separation is gradual, present no deviation from the normal appearance.

Mixed with the fur may be sometimes found pigment, blood corpuscles, mucous or pus corpuscles, or the remains of vegetable and animal portions of food.

The colour may be white or milky, or may present various shades of yellow or brown.

The nature and cause of some of the changes in colour are very imperfectly understood. Some of them arise from articles of food, medicinal substances, tobacco, etc.² a large proportion, however

¹ Miquel, *Prag. Vierteljahr.* iv. 1850. Kölliker, *Microscop. Anat.* ii. § 2, p. 30.

² Dr. Chambers has cited an instance where the tongue was coloured brown from the occupation of tasting tea: "Indigestions," p. 111.

are caused by slight hemorrhages from the gums; while some others, and especially those occurring in fevers, remain unexplained. Excepting, however, those cases where there is direct pigmentary discolouration from jaundice, when other tissues participate in the change, there is no foundation for the common belief that a yellow fur on the tongue has any necessary connection with hepatic disorder.

As regards the chief causes to which the production of this fur is attributable, may be mentioned—

(a) Idiopathic conditions in which the tongue of some persons may, consistently with apparently perfect general health, form and throw off a much larger amount of epithelial covering than is ordinarily the case; inquiry should, therefore, be directed to this point before any general conclusions are formed respecting the indications to be drawn from its presence.

(b) States in which a coating is formed on the tongue by the simple drying of inspissated mucus and saliva, owing to the mouth being kept open, as is often the case during sleep.

(c) Conditions of irritation in the mouth itself, giving rise to an increased production of epithelium on the cheeks, gums, and tongue, and which, from their similarity to the state of other mucous membranes, where increased secretion, attended with shedding of the epithelial covering, is the result of irritation or subacute inflammatory action, are usually termed catarrhal. The belief that this is the true pathology of this state, is also favoured by the coincidence, in many such cases, either of a general redness of the surface, beneath the thickened epithelium, or of hyperæmia and enlargement of the papillæ, especially of the papillæ fungiformes of the lateral and anterior portions. In some instances, also, the inflammatory state is further evidenced by the production of aphthæ, giving rise to slight and superficial ulcerations, with a reddened base, and often surrounded by a reddened margin.

Many of these conditions of the tongue may, however, be due to local causes, such as carious teeth,¹ or other sources of irritation to the fifth nerve,² or to accumulation of food around the bases of the teeth, or to medicinal agents affecting the salivary glands and mouth,

¹ For some curious instances of this kind, where the fur was situated on the same side as the carious teeth, see Hilton, "Lectures on Rest and Pain," p. 195, et seq.

² Anstie, *Lancet*, 1866, ii. 200.

as iodide of potassium and mercury, or to the habit of smoking (though this does not ordinarily produce a thickened epithelial fur, nor hyperæmia of the papillæ fungiformes, its effects being generally limited to an enlargement of the papillæ filiformes, which gives to the surface a finely roughened aspect). As smoking, however, is not an unfrequent cause of stomach affections, our observations on this head are always attended with certain grounds of fallacy.

(2) The largest class of diseases not primarily affecting the stomach, with which a furred state of the tongue is most frequently found to coexist, are the acute febrile and inflammatory affections; and in them a correct estimation of the semeiological nature of these appearances is a matter of considerable difficulty.

The dryness of the tongue in fevers and in the later stages of adynamic diseases is due, in part, to the mouth being kept open during respiration; but this cause is far from explaining the whole of this phenomenon, and a much larger share in its production is attributable to the arrest of secretion from this as from many of the other mucous surfaces and glandular organs, which forms one of the striking peculiarities of the febrile state.

The redness, the enlarged papillæ, and the increased production of fattily degenerated epithelium, are all, however, phenomena indicative of the inflammatory condition; and it would be certainly remarkable that the mouth should *alone* show evidences of this condition in so many diverse morbid states, which have only in common the one general element of pyrexia.

Pathological research, however, tends increasingly to show that the pyrexial state, by affecting the nutrition of all the tissues of the body, gives rise to a series of anatomical changes which in many other instances, as well as in that now under consideration, are frequently undistinguishable from those which mark the existence of inflammatory action; and there are very few of these disorders in which, at least, the *functions* of the stomach are not more or less deranged, while direct anatomical evidences of coincident organic alterations of this organ may be found in a considerable proportion.

It is chiefly, however, on evidence based upon this class of diseases that discredit has been thrown on the value of the appearance of the tongue as a sign of gastro-intestinal disorder. Although, however, the statements made regarding the absence of uniformity of coincidence between changes in the tongue and those observed

in the stomach rest on such authority as that of Louis¹ and Andral, yet a careful examination of the premises which support their conclusions tends to throw some doubt on their validity, or at least to show that the question requires further examination, since both these authors regard as diseased states of the stomach various forms of softening, and also the condition of mammillation, which are now generally removed from the category of pathological alterations. Many also of the finer but more important pathological changes, existing both in the febrile and in other catarrhal states of the stomach, are only revealed by microscopic research, and were therefore unknown to the authors in question. To this also must be added the fact that the slightest departures from health to disease are very liable to be overlooked in this organ, and that many of the signs of the latter, especially those of undue vascularity, often become indistinct after death. It is thus easy to understand that the statements of Andral,² referring to the relative appearances presented by the stomach and the tongue in cases of typhoid fever, but sometimes quoted by other authors as extending to other classes of disease, to the effect (to quote his own words) that "(1) No constant relation can be established between the state of the tongue and that of the stomach; (2) Each of the modifications which the tongue can offer, in colour or in coating, does not correspond with a special modification of the stomach; (3) The stomach may present after death conditions resembling one another, however dissimilar may have been those of the tongue;" may yet fail in all instances to express the true relationship between the affections of the two membranes. It must further be remembered that Andral³ regarded as the results of *inflammation* both cancer and the chronic or perforating ulcer of the stomach—diseases universally admitted to be unattended by any constant morbid changes of the tongue; and though, therefore, his conclusions are justified in the whole class indiscriminately, they do not apply to particular varieties.

In some of the febrile diseases the appearance of the tongue has been regarded as being almost *sui generis*, and of a specific character. This is especially the case in scarlatina, but in this disease the

¹ *Fièvre Typhoïde*, i. 475; *Phthisis*—Walshe's Trans., 220.

² *Clin. Méd.*, i. 531.

³ *Ibid.*, ii. 31, et seq.

recent observations of Dr. Fenwick¹ have shown that the stomach participates, to a large extent, in the organic alterations induced by this affection. In another class the buccal and lingual surfaces appear to suffer through participating by continuity in the inflammatory conditions of other portions of the gastro-pulmonary mucous membrane, as in affections of the nose and pharynx, and in some cases of bronchitic, or laryngeal, or pulmonary inflammation.² In the majority, however, of these cases, and particularly when a thickly furred tongue accompanies inflammatory conditions of the lungs and air-passages, I believe that it is to be taken as significant of a gastric rather than of an uncomplicated pulmonary catarrh.

In tonsillitis, on the other hand, the rapidity and extent with which the tongue is affected is proportionably greater than in almost any other of the febrile diseases. In such cases, any one who has witnessed the almost constant correspondence between the changes in the tongue and the state of the fauces, both as regards invasion, acme, and decline, can hardly fail to believe that the alterations in these parts are very similar, if not identical, in their nature; and that, although the stomach undoubtedly does participate in the disturbance of nutrition accompanying the pyrexial fever which attends the angina, yet here, at least, the condition of the tongue is disproportioned to the amount of the constitutional affection, and is largely dependent on local causes.

(3) Conversely, however, the observations of a certain interdependence of inflammatory changes in the tongue and stomach are very numerous to be even quoted in this place. They are, moreover, especially verified by the observations of Dr. Beaumont on Alexis St. Martin, which present the most convincing proof of the frequent coincidence of these affections.³ Other analogies give an *à priori* support to this view, such as the increased salivation which attends many irritative conditions of the stomach, and which, whether regarded as functional or organic—whether a pure neurosis, or associated with anatomical changes in the glands—points strongly to the coetaneous affection of parts even as widely remote as these might at first sight appear to be.

¹ Med.-Chir. Trans., xlvii. "On the State of the Stomach and Intestines in Scarlatina."

² Rostan, Cours de Médecine Clinique, pp. 61, 62.

³ See especially "Experiments and Observations," etc., by Dr. William Beaumont; Combe's edition, 1838, pp. 170, 171, 173, 177-8, 250.

The writings also of Andral¹ supply us with repeated instances of simultaneous affections of the stomach and tongue, where the alterations described in each of these parts bear a striking resemblance to one another, when allowance has been made for the differences in their anatomical texture.

Both Andral's and Beaumont's observations show that it is especially with the irritative and inflammatory conditions of the stomach and intestines that these alterations in the tongue most constantly coexist. In other diseases of the stomach the tongue and mouth usually remain unaffected, unless accidental irritation be present, as in the pure neuroses, in obstructions of its cardiac and pyloric orifices, in dilatations resulting from the latter cause, in thickenings of the submucous tissue without implication of the mucous membrane, and even in many cases of cancer and ulcer, so long as these are not attended by an inflammatory condition of the general mucous surface. From this latter category of exceptions has, however, arisen the erroneous idea that changes in the surface of the tongue afford but little assistance in the diagnosis of diseases of the stomach—a proposition which is perfectly true if applied to all diseases indiscriminately, but which would, if absolutely received, deprive us of information which is of great value in relation to irritative conditions, to which alone this semeiology is applicable, subject, however, to the careful elimination of the local and other general sources of fallacy to which allusion has been already made.

DERANGEMENTS OF THE APPETITE, AND THIRST.

Although derangements of the appetite not unfrequently occur among the symptoms of disorder of the stomach, yet it must be recollected that the sense of desire for food does not depend on this organ alone, but that it represents a certain state of the nervous system, induced in most cases by special conditions of the general nutrition in which waste is producing a corresponding effort at repair. As it can, however, in some instances be directly excited by stimulant substances applied to the stomach, it is probable that the condition of this organ participates more or less directly in the production of the sensation; and that, in consequence of this its double origin, deficiencies, perversions, or excesses of the appetite,

¹ Clin. Méd., ii., Gastrite Aigue.

may be attributable to causes affecting either the nutrition or innervation of the stomach alone, or of the system generally.

Anorexia, or loss of appetite, is found to be generally associated with inflammatory states of the stomach, though when these are sub-acute, or exist in a chronic form, the opposite condition is sometimes observed. In cancer of the stomach this symptom is frequently observed, and it also accompanies derangement of other parts of the digestive tract, among which constipation holds a prominent position. In contradistinction to these more purely local causes, impairment of appetite coexists with other and more general conditions of the system, in which, however, the stomach may be presumed to participate. Among the chief of these may be mentioned febrile states and conditions of defective general nutrition or of impaired innervation. It is thus observed to result from deficient muscular exercise, from old age, from long-continued habits of abstinence, from the exhaustion produced by hot climates; and also from excessive fatigue, whether muscular or intellectual, from the various depressing moral emotions, or pain, and from the influence of narcotic remedies.

Excessive appetite (boulimia, fames canina, cynorexia) also occurs under a variety of conditions, some of which are referable to anatomical conditions of the stomach, others to general states of the system, and others to disturbances of innervation.

With some persons the habit of eating to excess is so constantly indulged in that it becomes a constitutional peculiarity, and in such patients there may be either a general obesity, or they may still remain spare and thin, the food taken not being assimilated (*Boulimia Helliconum*, Cullen).

Various organic alterations of the stomach, or of other of the abdominal viscera, have been found associated with this symptom. Among these have been described worms in the stomach and intestines, great enlargement of the stomach (though it may be questioned whether this change be a cause or a consequence of the affection), induration and thickening of its coats, enlargement of the valvulæ conniventes of the intestines (Beclard), absence of the gall-bladder, and insertion of the common bile-duct into the pylorus. The establishment of biliary fistulæ in dogs is known to have the same effect, though the symptom is not noticed as a rule in any of the diseases of the liver most commonly met with.

This condition of appetite is also observed in certain constitu-

tional conditions, as in diabetes and in the convalescence from acute diseases, or during recovery from excessive exhaustion from other causes, in which cases, if the desire for food be not speedily satisfied, feelings of faintness and sinking speedily supervene. Certain nervous affections also are sometimes attended by this symptom; it occurs in some forms of insanity, and at the commencement of attacks of hydrocephalus or epilepsy (Copland); and in various forms of hysteria and hypochondriasis; in the two latter diseases, however, the appetite may fail, or may be replaced by some of the perversions next to be noticed.

In a minor degree an uneasy craving for food also accompanies many irritative conditions of the mucous membrane, and is often observed when acidity is present. In these cases, however, the appetite is speedily satisfied, and even when the sense of hunger is present the sight of food may be repulsive.

Perversion or depravation of the appetite (pica, malacia, pseudo-rexia) often, but not necessarily, coexists with boulimia, and implies a craving desire for articles of food which are repugnant to ordinary tastes, or an excessive indulgence in the use of substances which usually are only taken in limited quantity. In some cases this condition of the appetite appears to betoken a special state of the stomach, but in others it depends on some more general cause, and is most commonly found associated with disturbances of innervation.

Thus, when excessive quantities of chalk are eaten, such a craving probably depends on an excessive acidity in the primæ viæ, and direct evidence of this condition is, in some cases, attainable through eructation and vomiting; but, in other instances, where offensive and loathsome materials have been taken, the latter series of causes are more commonly in operation.

These perversions are more common in the female than in the male sex, and are especially frequent in pregnancy, chlorosis, and hysteria; they occur also in mania and idiocy, though, when met with in the last-named state, it may be considered probable that the sense of taste is perverted or wanting.¹

Of these alterations, the loss of appetite is of most value as a symptom of disorder of the stomach. Caution is, however, requisite

¹ For more complete information on this subject the reader is referred to Copland's Dict. of Medicine, art. "Appetite;" and Landre Beauvais, art. "Boulimia," Dict. Sciences Méd. iii.

in forming this conclusion, and not only in the discrimination of its cause, but also in the use of remedies calculated to arouse or increase the sensation when it is absent or defective; for such remedies, though ordinarily termed tonics, but partaking, in the majority of instances, of the nature of stimulants, are not unfrequently prejudicial in weak or irritable conditions of the organ.¹

Thirst is a sensation which is ordinarily even less than hunger referred directly to the stomach, being mainly felt in the fauces.² It may, moreover, be relieved by the introduction of fluid directly into the blood,³ but, on the other hand, it may be excited by irritants introduced into the stomach. It is almost invariably present in pyrexial conditions, and in any state involving an excessive loss of fluid by any of the secretions; hence it occurs in a very marked form in diabetes, and is more felt in hot than in cold seasons. Independently, however, of the causes here enumerated, thirst is a very constant concomitant of irritative conditions of the stomach, when it usually appears some hours after a meal, and occasionally, when other causes, and particularly habit, can be excluded, it forms a valuable adjuvant in the diagnosis of these states.

FLATULENCE.

By flatulence is meant an excessive formation or accumulation of gas either in the stomach or bowels, giving rise to undue distension of the viscera; this is often attended with borborygmi or colicky pains, which are followed in some cases by the expulsion of the gas, though there is reason to believe that this may also be occasionally absorbed.

It is only to an undue accumulation of this nature that any pathological significance can be attached, since it is probable that some air is always to be found in the intestinal canal; the calibre of which, however, as may be observed in animals opened imme-

¹ This subject will be further treated of under the indications given for the use of these remedies in diseases of the stomach, when an attempt will be made to show that the sense of appetite excited by their agency is by no means constantly proportioned to a corresponding increase in the digestive powers.

² Carpenter, Princ. Human Physiol. p. 52. Bernard's experiments on dogs in whom a gastric fistula had been established, afford convincing proofs that the sensation is not due to mere local conditions of the mouth and fauces. Though the animal drank largely, yet the thirst was not allayed until the fluid was allowed to remain in the stomach. (Liq. del'Org. i. 51.)

³ Carpenter, Princ. Human Physiol. p. 52.

diately after death, is much smaller than might be believed from the results of post-mortem examinations made after relaxation of the muscular coat has ensued.

The terms in use to signify the conditions of distension are *tympanites* and *meteorismus*, the latter being employed for excessive degrees of distension common to the whole tract, and occurring acutely; but both, as in ordinary use, are more especially applied to the intestine rather than to the stomach, for which latter there is no distinctive nomenclature.

The sources of the gas found in these situations have been long a subject of discussion, and opinions are not as yet absolutely decided whether some secretion of this nature may not take place from the mucous membrane of the stomach and intestines. This view received in some measure the support of John Hunter¹ (who, however, with his usual caution, admitted that it was not capable of receiving direct proof, and also that in many cases the gases formed were derived from fermentative changes, the result of imperfect digestion of the food).² It is chiefly based on the rapid distension which the stomach or some portions of the intestines may undergo, either when empty, or within a period after the ingestion of food which may be reasonably supposed to have been too short to allow of the fermentative process to have reached a height sufficient to account for the evolution of the amount of gas present. There is, however, an entire absence of evidence tending to show the spontaneous occurrence of any such secretion; and though it is possible that some diffusion may take place between gases already present in the intestine and those in the blood, all recently and carefully conducted experiments on portions of ligatured intestine negative the idea of a free secretion occurring from the mucous membrane;³ and the distension of the stomach under the circumstances now alluded to may be accounted for in another manner, which appears to present a greater degree of probability.

(a) It is believed by many that in the cases of sudden flatulent distension which occur in hysterical subjects under emotional influences, much of the gas present consists of air swallowed, and the power of thus distending the stomach is in some persons subject to the control of the will, and can by them be employed as a means

¹ Obs. on Certain Parts of the Animal Economy, 1792, p. 206.

² *Ib.* p. 203.

³ Kühne, Lehrbuch der Phys. Chem. 141.

to excite vomiting.¹ (b) In other cases, especially in atonic and weakened conditions, it would appear to the author that the stomach, instead of remaining contracted when empty, has its muscular coats relaxed, and becomes filled with air entering from the cardia,² and that the feeling of distension and subsequent expulsion of gas which follows the ingestion of food arises from the contraction thus excited. It is probably also to a similar condition that those local distensions of the intestines may be due, which occur in cachectic and chlorotic individuals and in the course of severe prostrating disorders. Excessive local irritation or inflammation, whether of the peritoneal, muscular, or mucous coats, may also give rise to such distensions by causing a paralytic state of the organic muscular fibre of the digestive tract. The most marked effects of this nature are produced by peritonitis, when the action is probably of a twofold kind, and results both from implication of the sympathetic and spinal nerves, and also from direct extension of the inflammatory process to the muscular coat. Similar conditions not unfrequently accompany or follow the excessive use of purgative remedies, and are observed also in inflammatory states of the mucous membrane; and, lastly, they may result from direct cerebral or spinal irritation, as they frequently accompany hysteria and paralysis, and more particularly those forms of the latter which depend on lesions of the spinal cord.³

If therefore we exclude the idea of a direct secretion as a cause of these accumulations of gas, we may reduce their sources to two,* which are—(1) Atmospheric air swallowed with the saliva and food, (2) The products of fermentative decomposition of the ingesta: and the analyses of the gaseous contents of the gastro-intestinal canal confirm the opinion thus advanced as to their origin.

The oxygen of the air swallowed appears rapidly either to enter into combination with matters present in the stomach, or to be absorbed by the blood in the capillaries of the mucous membrane, and the gases ordinarily found in the intestines consist almost en-

¹ Frerichs, Wagner's Handwörterbuch der Physiologie, art. "Verdaunung," p. 867. Bamberger, loc. cit. 237.

² Budge has shown that a large amount of air enters the stomach before the act of vomiting.

³ Bamberger, loc. cit. 236.

⁴ As a third source might be mentioned here gases contained in effervescing liquids; these, however, when taken in moderation, are either eructated or possibly absorbed, since, under normal circumstances, they give no further indication of their presence.

tirely of nitrogen, carbonic acid, and hydrogen. In the stomach, traces of oxygen still remain, but are entirely absent in the intestinal canal, where the nitrogen represents the residual component of the atmosphere and the gradually increasing proportion of hydrogen and its carburetted and sulphuretted compounds points to their origin being mainly attributable to fermentative changes occurring in the ingesta,¹ and possibly (in unhealthy conditions of the system) in the secretions of the intestinal canal themselves. It is to these causes that the excessive production of flatus is due in the majority of instances in which it occurs, since the other conditions before mentioned are rare when taken into comparison with the frequency of the disorder. The source of this must therefore in most instances be sought in disturbances of the digestive process, the natural influence of which, in checking fermentative action, may be so perverted as to allow or even favour the occurrence of changes of this nature. Such perversions must, it is evident, depend on altered relations of the food to the gastro-intestinal secretions, and may arise (a) from improper qualities of the former, as when matters already fermenting are introduced into the intestinal canal—or (b) from the ingestion of an amount of food disproportioned to the digestive powers of the gastric juice—or (c) from deficiency in quantity and defects in quality of the salivary and gastro-intestinal secretions, or of the order and regularity in which the food is exposed to their influence. The last-named class alone requires special attention in this place. Among the causes so operative may be mentioned—

1. All conditions, whether arising from functional or organic disorders of the alimentary canal, which can interfere with an adequate secretion of gastric juice in the stomach, or with the proper supply of bile,² pancreatic fluid, and intestinal secretions in its lower portions.

2. Abnormal products of the mucous membranes, and especially mucus, have a special tendency to set up this fermentative action, and their effects are chiefly apparent on the amylaceous and saccharine articles of diet, which may undergo the alcoholic, acetic, butyric, viscous, or lactic fermentations. The three first named evolve either carbonic acid, or a mixture of carbonic acid and

¹ Lehmann, Handb. der Phys. Chem. 271.

² Dogs in whom biliary fistulæ have been established, pass a great quantity of offensive flatus per anum.

hydrogen, while the last, though not necessarily associated with the formation of free gases, is yet so frequently found to pass into the changes resulting in butyric acid, in which these are evolved, that an explanation is easily afforded of the occurrence of flatulence when substances are taken in which the lactic acid fermentation is specially known to occur, as is the case with milk, the flatulent effects of which have been observed since the time of Hippocrates.¹

The gaseous compounds which contain sulphur are more directly derived from protein substances, and especially from those which are rich in this element, such as eggs, leguminous vegetables, and certain of the cruciferae.²

3. Arrest of the food in the stomach, by obstruction of the pyloric orifice, preventing its further changes in the intestines, speedily gives rise to fermentative action, attended with a great development of gas together with the formation of *torulæ* or the *sarcinæ ventriculi*.

4. Changes of an improper character having been once set up or determined in the passage of the food through the stomach, are frequently continued throughout the intestinal canal, until the evacuation of the imperfectly digested matter ensues per anum. If by constipation or otherwise this be delayed, the fecal masses often continue to yield considerable quantities of gas, which becomes impregnated with their peculiar odour, while the pultaceous and frothy character of the evacuations serves as further evidence of the changes which they have undergone.

5. Causes preventing absorption of the alimentary matters also act in the same direction. Instances of this are observed in the catarrhal conditions of the intestinal mucous membrane, and in those cases when, from disease of the mesenteric glands, their function is peculiarly interfered with, and when extreme degrees of tympanitic distension frequently occur.

¹ Aph. 64, sec. v.

² Frerichs, Rep. Clin. Lect., Med. Times and Gaz. 1861, II. 410, divides the fermentative processes which may take place in the stomach into the following:—(a) Alcoholic; (b) Lactic; (c) Butyric. The lactic, which is a simple acid fermentation, causes no evolution of gas. The butyric succeeds the lactic, and is associated solely with the evolution of carbonic acid, but as butyric acid is volatile, it is perceptible in the eructations. Alcoholic fermentations may be associated with the formation of acetic acid, and may thus give rise to acid eructations. The conditions of fermentation, according to Frerichs, are the delay of absorption and the presence of mucus in the stomach.

ACIDITY AND PYROSIS.

These symptoms are frequently included in one category as the results of processes of abnormal secretion occurring in the stomach. With regard to the former, it must be remarked that though sometimes arising in this manner, yet in a large proportion of the cases in which an excessive amount of acid is formed in the stomach, its origin is to be sought in fermentative changes rather than in excess or perversion of the natural secretions of the mucous membrane. We are therefore compelled to distinguish its modes of origin under the two heads of acidity from fermentation, and acidity from hypersecretion.

A. Acidity through fermentative action takes place under circumstances similar to those in which flatulence occurs, in which it has been seen that the acetous and butyric and lactic acid fermentations are very common in the amylaceous and saccharine articles of food.

The facility as well as the rapidity with which the formation of lactic acid takes place under circumstances favouring its production, affords an explanation not only of the frequency with which it is found in the stomach, but also of the opinions formerly entertained by many observers (and from which Physiology can hardly be said as yet to be entirely free) that this acid was a product of its secretion, and was the chief agent in the digestion of the food: to the same fact is also attributable the somewhat undue share often ascribed to hypersecretion in the explanation of the phenomena of acidity.

The causes of the production of this symptom from fermentative changes having been already dwelt upon under the head of flatulence, only require to be briefly recapitulated here. They may be summed up as:—

- (a) Conditions in which digestion is simply delayed.
- (b) Those in which mucus possessing a catalytic power is secreted by the stomach.
- (c) Cases where the food is retained in the stomach by obstructions at the pyloric orifice, and which, as pointed out by Cullen,¹ are the sources of the most extreme degrees of this affection.
- (d) Cases where food in a state of fermentation, or capable of ex-

¹ Works, ii. 379.

citing catalytic action, is introduced into the stomach in quantities sufficient to overcome the antiseptic properties of the gastric juice.

(e) Allied to the above may also be mentioned conditions of the saliva and buccal secretions, and especially acid states of the latter, which tend to cause improper changes in the starchy compounds during the process of mastication.

(f) To these must be added cases where, in otherwise healthy subjects, an excess of saccharine or amylaceous diet is habitually taken with the food.

An explanation is thus afforded of the frequent coincidence of acidity and flatulence, since both originate from identical changes in the food. It may happen that one is sometimes more prominent than the other, or that flatus may be formed in the intestines when only minor degrees of acidity are observed in the stomach—a condition which may be explained by the fermentative action which has only commenced in the upper part of the canal being continued through its entire course: nor need it be wondered at that these symptoms are among the most common evidences of gastric disorder, as almost any cause capable of disturbing the digestive acts may serve as the agency by which both are induced.

B. In addition to the above class, which includes a much more considerable number of cases than is sometimes believed, there is, however, another, in which we are compelled to admit that a true hypersecretion takes place from the mucous membrane, giving rise to the disorder usually termed *pyrosis*.¹ The products thus formed vary, however, considerably in their reaction, this being sometimes of an acid and sometimes of a neutral character; and we are hardly as yet capable of distinguishing the special conditions in which these differences originate, since either may appear under circumstances apparently similar. It has been advanced by some recent writers that the neutral fluids thus ejected consist principally of saliva which has been swallowed, after having been secreted under conditions of reflex irritation proceeding from the stomach,² and

¹ *Pyrosis*, Soda (πῦρ, fire), and meaning really the heartburn which accompanies hypersecretion, is often employed to signify an idiopathic functional disturbance, in which this excessive secretion forms a prominent symptom. It will be shown in the following pages that this limitation is one that is neither strictly accurate nor practically available, since the affection may arise from organic disease of the stomach, or be a symptom through reflex agency of diseases in distant organs.

² That the saliva is thus secreted is shown by the observations of Beaumont, loc. cit. 132.

this view has been chiefly based on the observations of Frerichs,¹ that an appreciable amount of sulphocyanide of potassium has been discovered in them. Without disputing the possibility that some portions of these fluids may owe their origin to this cause, it yet, however, seems improbable that it can be their exclusive or even their most frequent or principal source. In a large number of cases, patients who are subject to neutral or alkaline pyrosis are by no means conscious of an amount of salivation at all proportioned to the quantity of fluid ejected, and the sulphocyanide of potassium and buccal epithelium found in the vomited matters may be easily accounted for by the saliva secreted and swallowed during the nausea preceding their regurgitation, or which has mingled with the secretions of the stomach in the act of vomiting.² We also must recollect that the stomach is largely endowed with glands whose secretion consists of an alkaline³ mucus, which, though ordinarily very tenacious, and which sometimes is ejected in this condition in very large quantities,⁴ may in every probability, when we reason from the phenomena witnessed in other mucous membranes, acquire the more fluid character which is sometimes observed in the watery flux to which the term *gastrorrhœa* has been applied.

The question regarding the circumstances in which these perversions of secretion take their origin is one of considerable interest; and though data are not quite positive, and are mingled with some of the fallacies and difficulties to which allusion has just been made, we have yet a sufficient number of facts illustrating these phenomena to justify a fair amount of inference as to the circumstances with which they concur.

In limine it may be stated that the effects of inflammatory conditions have been hitherto shown to be invariably attended with arrest or diminution of the acid secretions of the stomach,⁵ but at

¹ Handwörterbuch der Phys., art. "Verdauung," p. 791.

² Dr. Fenwick, Diseases of the Stomach and Duodenum, p. 131, has found epithelial casts of the stomach in the fluid thus ejected, showing that it proceeds from the stomach. In other cases, however, the fluid only contained epithelial cells from the mouth.

³ This reaction was shown by Bidder and Schmidt to be independent of that of the saliva swallowed. (Die Verdauung's-säfte und der Stoffwechsel, 40.) See also Frerichs, Wagner's Handwörterbuch der Physiologie, art. "Verdauung," p. 788; Blondlot, Traité Analytique de Digestion, p. 213; Beaumont, Exp. and Obs., Combe's edition, p. 182; Corvisart, Longet's Physiologie, 1861, i. 184.

⁴ See Andral, Clin. Méd. ii. 80.

⁵ Bernard has shown that in this condition the ordinary stimulants of the gastric juice, and even the application of alkalies (the most powerful of this class) fail to excite secretion. (Arch. Gen., Suppl. 1846, p. 7.)

the same time to be frequently associated with the formation of a large amount of mucus of an alkaline reaction. It is probable, therefore, that the former of these, when appearing in undue amount, cannot be owing to inflammatory processes, and that in their case an origin must be sought in other conditions of perverted secretion, but that the alkaline varieties may originate under circumstances of both organic and functional irritation.

The principal agencies, however, which are concerned in the production of hypersecretions both of an acid and alkaline character, are those which are connected either with direct or reflex irritation of the nervous system, and it is especially to these that allusion will now be made.

The influence of the nervous system on the secretions of the stomach has been a subject regarding which very contradictory statements have been made, though it has been long known that they may be excited or arrested by emotional causes, and that the flow of gastric juice may, like that of the saliva, be caused by the mere sight of food.

The chief experiments have been made with regard to the effects of section of the pneumogastric nerves; and the results of these have varied greatly in the hands of different observers. Bernard¹ and Frerichs² asserted that after this operation the secretion of the stomach was alkaline, and had lost the power of coagulating milk; while others state that it still remains acid;³ and others again that there is a diminution of the amount secreted, and an impairment, though not an arrest, of the digestive process.⁴ Bernard has, however, found that galvanizing the sympathetic branches proceeding to the stomach arrested,⁵ while stimulation of the pneumogastric nerves,⁶ or section of the fourth ventricle above their origin,⁷ greatly increased the secretion.

These observations, though somewhat discrepant, still show that a very decided influence is exerted both quantitatively and quali-

¹ Liq. de l'Org. ii. 372. Lec. Syst. Nerv. ii. 417, 421.

² Wagner's Handwörterbuch, iv., art. "Verdauung," p. 283.

³ Brücke, Sitzungsbericht der KK. Akad. zu Wien, xxxvii. 168.

⁴ Bidder and Schmidt, Die Verdauung's-säfte und der Stoffwechsel, p. 26.

Kölliker and Müller (Würzburg Verhandl. 1855, p. 220) have arrived at the conclusion that food was digested after the operation, but that the secretion was altered, being less acid than natural. For the report of numerous other observations on this subject see Carpenter's Physiology, ed. 1864, pp. 87, 88; also Longet's Physiology, 1861, i. 257.

⁵ Medical Times and Gazette, 1860.

⁶ Lec. Syst. Nerv. ii. 438.

⁷ Lec. Syst. Nerv. 461.

tatively on the gastric secretions, through altered conditions of nervous agency. The inference also of the possibility as well as the frequency of the occurrence of such alterations is further justified by Bernard and Ludwig's and by Kölliker's and Müller's¹ experiments on the influence of the nerves on the secretions of the salivary and pancreatic glands, and on the intestinal secretions.² By these it is shown that the secretions of these glands can be either completely arrested or materially changed by section or stimulation of their nerves, and that a copious and incessant secretion, but greatly altered in quality, follows the complete division of all their sources of nervous supply.³ When we consider the relation of these physiological facts to the phenomena presented by disease, it is to be remarked with regard to the latter, that the conditions in which hypersecretion is observed are (1) those in which other phenomena indicative of perverted nervous action are discoverable, not only in the stomach, but also in other parts of the system; and (2) that this is more common in cases of cancer and ulcer than in any other organic affections, its frequency in these diseases being explicable by the fact that, by invading the deeper coats of the stomach, they cause a more serious implication of the nerves than is produced by the more superficial effects of inflammatory action. With regard to the first series, it may be noted that they occur either in states of general weakness or of undue excitability of the nervous system, and that they are then frequently attended with severe pain and vomiting, which are often quite out of proportion to the other disturbances of digestion present, and which appear independently of other phenomena indicative of organic disease. In such cases it is probable that hypersecretion may take place from the mucous membranes with the same facility and in the same disproportion to the exciting cause, as is observed in the profuse perspiration which the slightest exertion will induce in debilitated subjects.

In other instances the symptom appears among a series of reflex phenomena of a similar character, depending on irritation existing in other organs. Among the most marked instances of this class may be cited the various disorders of the uterus, and particularly the state of pregnancy, which is not unfrequently associated with similar conditions of other glandular organs, and especially with

¹ Würzb. Verhandl. loc. cit.

² Bernard, Liq. de l'Org. ii. 341.

³ Kühne, Lehrbuch der Phys. Chemie.

an excessive flow of saliva, and which appear to point most conclusively to this mode of origin. To these also may be added in all probability disorders of dentition,¹ and the effect produced by the passage of a gall-stone, to which attention has been fully drawn by Dr. Budd.²

The history of *pyrosis*, as it occurs endemically among the poorer classes of Scotland and other northern countries, and the comparative frequency with which it is associated with anæmia and cachexia,³ point not only to its origin in those persons whose nervous powers are weakened by insufficient and improper food, but also to the fact that the continued use of the latter may possibly so pervert the balance of function of the stomach that it reacts excessively, but with a perverted secretion, on the application of normal stimuli. A similar condition may possibly afford an explanation of its occasional occurrence in the wealthier classes when no other adequate cause can be found for its appearance; since it appears probable from observations made by Corvisart, Frerichs, and Bardeleben, that there is a great variety in the character of the secretions afforded by the stomach under the influence of different stimuli.

Thus Bardeleben and Frerichs⁴ found that the introduction of common salt in powder into a dog's stomach produced a quantity of mucous secretion which was either very feebly acid, or neutral or alkaline, in its reaction.

Blondlot⁵ and Beaumont⁶ have shown that the operation of cathartics is to cause a great increase of the mucous secretion; and Corvisart⁷ found not only that ipecacuanha produced the same results, but further, that artificial irritation by mechanical means, as sand or charcoal, gives rise to a secretion which, though acid, has less digestive power than that evoked by other means.

It has been long a general subject of belief that acidity of the

¹ These disorders, though placed by Dr. Budd under sympathetic irritation of the stomach, are often of a more mixed character, and frequently result from improper food given at the time of weaning; and though in some cases the sympathetic affection of the stomach may be a pure neurosis, yet in others it belongs to the catarrhal character.

² Loc. cit. p. 191.

³ Budd, loc. cit. p. 275. I have, however, seen cases of this affection in female patients in whom, though presenting family histories of an hysterical tendency, no appearance of either of the above states was present, and whose menstruation was perfectly regular.

⁴ Loc. cit. p. 788.

⁵ *Traité Analytique*, p. 213.

⁶ Loc. cit. p. 182.

⁷ Quoted from a written communication to Longet, *Physiologie*, 1861, i. 184.

primæ viæ may depend in some degree on the presence of abnormal matters in the blood; and judging from pathological observations, especially in gouty subjects, this would seem a not unreasonable inference, though the presence of uric acid has never been shown in the gastric secretions, and many of the earlier views entertained regarding the secretion of various acids from the stomach, when injected into the blood, have been shown by Longet¹ to rest on no secure basis of observation.

With regard to gout, it must also be remembered that the conditions of acidity in the stomach in this disease are manifold, and that it may depend not only on the hypersecretion, at present under consideration, but also on fermentative changes induced in the food either through imperfect digestion or from perverted secretions furnished during the subacute inflammatory conditions of the stomach to which gouty patients are peculiarly liable. There is, however, another class of cases in which abnormal materials in the blood have this effect, since Bernard has shown that after extirpation of the kidneys a continuous secretion is furnished by the stomach, which although acid and possessing digestive properties, is found on the addition of liquor potassæ to contain large quantities of ammonia,²—a fact which may seem in part to explain some of the disorders in the functions of this organ which occur in the course of Bright's disease.

Although many of the symptoms by which the presence in the stomach of an excess of free acids is revealed to us are common to all the circumstances under which they are produced, yet there are certain characteristics distinguishing the two main classes which have now been considered, which in a measure, and according to their greater or less prominence, may serve to indicate the different causes from which they originate. It must however be borne in mind, that in many cases the state present is a complex one, and that neurotic affections giving rise to hypersecretion may alternate as well as coexist with either catarrhal or atonic conditions, which are the most common causes of fermentative changes in the food; so that, although in many the leading features are distinguishable, cases are nevertheless presented in practice which frequently deviate to a greater or less extent from the more distinctive lines of classification.

¹ These views are alluded to by Longet, *Physiologie*, i. 186, and are to be found in an inaugural Thesis of Bernard in 1843.

² *Liquides de l'Organisme*, ii. 49.

The process of *digestion* is often impaired in both forms, but to a more marked degree in the fermentative variety. The injury to this function from hypersecretion is however easily comprehended when we recall the observation that the fluids thus produced, though presenting a highly acid reaction, may still possess very little true digestive powers. The more neutral secretions occasionally furnished under these influences seem to be almost totally deficient in the properties which distinguished the normal gastric juice.

Heartburn is also common to both forms, and as far as this symptom is concerned it possesses few distinguishing qualities. The sensation is usually one of heat or burning at the cardiac orifice of the stomach, accompanied with a feeling of fulness, and desire to eructate, experienced in the upper part of the pharynx, and which may long precede, or even exist without, any distinct regurgitation of acid. When this latter ensues, the sensation of acidity is distinctly felt in the upper part of the pharynx, and the mouth becomes filled with a fluid which is often sufficiently acid to set the teeth on edge, and portions of food may sometimes, though not always, be simultaneously returned. In other cases, when the amount of acid is greater (and this is especially, though by no means exclusively, true of the acidity of hypersecretion), vomiting may set in and large quantities of a highly acid fluid may be ejected:¹ the origin of which may in some instances be distinctly determined by its chemical reaction.²

Pain, though not a constant attendant on acidity, is occasionally met with in connection with both forms, and in both it may occur at variable times after food has been taken. In the acidity resulting from fermentation it is usually later in its appearance, and is associated with other signs and symptoms of flatulence, and with a sense of distension passing into cramp-like and colicky pains. The pain connected with hypersecretion has often a more burning constringing character, and is generally felt behind the sternum; and though in some cases of pyrosis it is sometimes not felt until

¹ Brücke found that alterations of the proportion of acid beyond the limits of 0.1 or 0.2 per cent. hindered solution in artificial digestion, though probably a higher degree of acid is present in the natural gastric juice. He also found that the amount of pepsine contained in the fluid directly influenced the rate of digestion. (Sitzungsbericht der KK. Akad. zu Wien, xxxvii. 1859, p. 138.)

² Thus Dr. Golding Bird, *Urinary Deposits*, p. 162, found in a case of scirrhus of the pylorus, associated with acid vomiting, "an amount of *hydrochloric acid* in the matter ejected equal to 22 grains of the pharmaceutical acid in the pint, in addition to some organic acid (lactic) sufficient to neutralize 7 grains of pure potassa."

two or three hours after a meal, yet in the majority it is perceived at a much earlier period, and often immediately follows the ingestion of food, and is accompanied by the heartburn and eructations which indicate its cause. It is almost a peculiarity of the latter form that it is equally, and sometimes even more speedily, evoked by a small meal, such as a biscuit or a cup of warm fluid, especially if associated with a glass of wine (alcohol being one of the most marked stimuli of the gastric secretion), than by a larger supply of food—the explanation of which is probably due to the fact that the amount of secretion is disproportioned to the stimulus which excites it, and that the excess, not being neutralized by food, acts as an irritant on the mucous membrane.

The pain attendant on hypersecretion is also in a large number of cases distinguished by the fact that it is most felt when the stomach is empty, and is relieved by the ingestion of food. In fact, this variety is often marked by a craving for food amounting at times almost to a boulimia, and in hysterical females is often associated with some of the perversions of appetite, or pica, which induces them to eat large quantities of antacid substances: while though, in acidity from fermentation, some relief is occasionally felt from eating, yet it is usually of short duration, and is speedily followed by an increase of distress and of discomfort.

The injurious effects on the system and on the nutrition of the patient are more marked in cases of acidity from fermentative change than in acidity from hypersecretion. It is reasonable to infer, though direct proof is wanting, that this may be in part due to the absorption of imperfectly elaborated or improperly changed materials in the food. Fermented liquors and other substances which give rise to acid dyspepsia markedly interfere with the action of the liver, as is seen by the constipation and paleness of the stools which frequently follow their use. The frequency also with which two very marked diathetic diseases—viz. gout and rheumatism—are preceded by this form of derangement, points at least to some possible participation of this process in the series of phenomena by which these attacks are ushered in. Sallowiness of complexion and dryness of skin may be in part due to the general cause of the acidity, but a very frequent result of these attacks is frontal headache of the severe form commonly known as the sick-headache, which, though so frequent a concomitant of this condition, has

probably a more general origin than in the special symptom now under consideration.

Contrary to what might have been expected, the urine more frequently shows an alkalescent reaction in the fermentative than in the secretory variety of gastric acidity; and this tendency, which is associated with great depression of spirits and loss of intellectual and bodily energy, is especially induced by vegetable food. This fact, of which I have observed numerous examples, tends strongly to support Dr. Roberts' view that the alkalinity in these cases is due rather to the addition to the blood of the alkaline bases of the food than to the withdrawal from it of acids, especially as the loss of these is to a certain extent neutralized by the alkaline secretions of the liver, pancreas, and intestinal canal. The acids formed from the food, being all oxidizable before they reach the kidneys, cannot suffice to restore the normal reaction of the urine, the alkaline tendency of which is probably increased by the diminution of the secretions from the other glandular organs before alluded to, caused by the imperfect stomachal digestion.²

Although the ordinary constitutional effects of acidity from fermentation are more marked than those from hypersecretion, it must be remembered that very serious results may occasionally ensue from the latter when carried to an extreme degree, owing to the vomiting and exhaustion to which it may give rise. This is especially true of the condition of pregnancy, when the life of the patient may be endangered from this cause, and numerous fatal cases of this character have been recorded, while others have only been saved from a similar issue by the induction of premature labor.³ M. Chomel⁴ has also added to these a category where, after the cholera epidemic of 1832, he observed eighteen cases of vomiting of acid matters, of which sixteen ended fatally, and he remarks that occasional cases have occurred in his practice since that period. The vomiting in cholera, it may be parenthetically remarked, has been in the author's experience almost invariably neutral in reaction, and the affection of the stomach in the acute forms has appeared to him to present the characters of a highly marked catarrhal and inflammatory condition; circumstances in which, as before remarked,

¹ Urinary and Renal Diseases, p. 25.

² Schiff and Corvisart have both expressed their belief that the secretion from the pancreas is largely influenced by the due absorption of peptones from the stomach.

³ See some cases by Guipon, *Traité de la Dyspepsie*, pp. 347 et seq.

⁴ *Des Dyspepsies*, p. 144: *Dyspepsie Acide Grave*.

acid secretions are hardly ever observed to occur. These cases of M. Chomel present some difficulty, the more so as post-mortem examinations were very rare: and we must remain in doubt whether they were examples of perverted secretion, or whether the acid matters vomited (of which no analysis was made) were not the products of fermentative processes in the food taken, which, as is seen in the case of children, may be thus changed with great rapidity.

The indications for arriving at a diagnosis between the two forms of acidity which have now been described, can only be regarded as of approximative value. The differences in the relation which they bear to disturbances of the digestion are, however, very marked, since acidity from fermentation is a common result of these disorders, while that from hypersecretion is either a cause or a final effect of other causes inducing such derangements.

It has been shown that none of the symptoms by which they are accompanied are positively distinctive of either variety. The matters vomited may also fail to afford any reliable test of their mode of origin, except such as may be derived from a quantitative chemical analysis, or from the occasional presence of confervoid growths, which may indicate the existence of fermentative action in the stomach.

The following table may, however, serve to exhibit in a concise form the chief points of distinction between them:—

ACIDITY FROM FERMENTATION.		ACIDITY FROM HYPERSECRETION.
Common.	FLATULENCE.	Rare.
	RELATION TO FOOD.	
Usually attains height some hours after food, and is more marked in proportion to the size of the meal, and inversely to the digestive powers.		Occurs in empty stomach or rapidly after food, and is often of great intensity after a small meal.
	PAIN.	
Less severe.		More severe.
	VOMITING.	
Rare.		Common.
	VOMITED MATTERS.	
May contain organic acids, torulæ, and sarcinae.		May contain an excess of hydrochloric acid.
	RELATION TO OTHER PHENOMENA.	
Occurs in connection with causes which impede digestion.		Most common as a reflex symptom or in connection with other nervous disturbance, or with ulcer and cancer of the stomach.

PAIN IN THE STOMACH

Has received various names: the most common of which are *cardialgia*, *gastrodynia*, or *gastralgia*.¹

The subjective symptoms embraced under these terms, and belonging to the category of perverted sensation, present all possible variations in degree, severity, and duration, from the uneasy consciousness of the possession of a stomach to pain of a severe and almost unendurable character.

By many of the older writers, to whom allusion has been made, it has been regarded as a distinct entity, and treated of with but little reference to its cause; and by some of these it has been made the basis of a classification for gastric diseases. The result of this manner of treating the subject has been to cause a confusion between pain resulting from organic and from functional causes, from which, and owing to the difficulty of distinguishing these in all cases during life, our medical literature can as yet scarcely be considered as entirely free.

There is a considerable variety in the exact site to which pain originating in the stomach is referred, though this is less remarkable when we consider the extent and complexity of the sources whence the nervous supply is derived. It will be seen later, that pain and other nervous disturbances may be felt in and referred to the stomach, which are really only expressions of disorders having their seat in distant organs; but it also is frequently found that diseases of this viscus may be the starting-point of abnormal sensation in remote parts. This is, however, rather true of more

¹ These terms have been applied with such varying meanings by different writers, that it is scarcely correct to speak of them as strictly synonymous, except as being expressions of the common element of perverted sensation. The first two are in most common use in this country, where *Cardialgia* is more commonly identified with *Acidity* or *Heartburn* (Copland, *Dict.* ii. 329; Cullen, *loc. cit.* ii. 465), and *Gastrodynia* with *Pain* in the stricter sense of the word. On the other hand, in France and Germany (Georget, *Dict. de Méd.*, art. "*Gastralgie*:" Romberg, *Dis. Nerv. Syst.* i. pp. 104, 129; Bamberger, *Krank. der Chylopoiet. Syst.* 163), *Cardialgia* (which is the classical expression of the older writers, Hoffmann, J. Frank, Schmidtman, and Truka) is used for the severer forms of pain, associated with intense depression and faintness, and is sometimes further limited to those of paroxysmal and spasmodic nature; while *Gastrodynia* is employed for pain of less severity but more continuous in character. The term *Gastralgia*, very little employed in this country, is used in France to signify a much wider range of phenomena, but all embracing various forms of uneasiness observed during the digestive process. Barras defines it as signifying the "morbid sensibility of the stomach" of Johnson; but under the theory of the neurotic origin of dyspepsia, he applies it to almost all forms of indigestion not having an inflammatory organic cause. See also Valleix, *Guide du Médecin Pract.*, iv. 3.

distant parts—as in cases when the disease of the stomach is revealed by cerebral pain or by neuralgia of the fifth nerve¹ and of the thoracic and abdominal muscles—than of the more contiguous viscera contained in these cavities, which are much more liable to give rise to pain which is referred to the stomach than to suffer in a similar manner from its disorders.²

Some of the slighter forms of uneasy sensation, as weight, oppression, and distension, not inaptly point to physical conditions connected either with the presence of abnormal quantities of undigested food, or of the gaseous products of its decomposition. In the severer forms of pain it is, however, important to remember that the *nature* of the sensation is seldom characteristic of its mode of origin, for it has been observed that there is little difference in this respect between the pain arising from severe organic affections, and that occurring in cases where no alteration of the coats of the stomach has been found after death;³ its semeiological value can only therefore be estimated by the aid of the concomitant phenomena with which it is attended.

The importance of the symptom appears, however, to render it desirable that a general summary should be given of its most frequent modes of origin and causation; for though there are few diseases of the stomach in which it is entirely absent, it forms a much more marked feature in some than in others.

That the stomach ordinarily possesses a certain degree of sensibility is shown by the observation of Beaumont,⁴ who, on passing a thermometer towards the pyloric region in Alexis St. Martin, found that it gave rise to severe cramp-like pain and distress, and left a soreness which continued for some hours afterwards. In other cases of the same kind the sensations produced by the contact of foreign bodies with the mucous membrane, at other parts than the pyloric region, have been rather those of sickness and faintness than of actual pain.⁵

There can be little doubt, however, that the mucous membrane

¹ Andral, Clin. Méd., ii. 158.

² The contiguity of site formerly led many to attribute pain originating in the stomach and duodenum to the liver, but this error is now much less frequent, and, though by no means entirely abandoned, is still to some degree maintained with regard to the origin of many dyspeptic disturbances in which the affection of the liver is only secondary to gastric or duodenal disorders.

³ Andral, Clin. Méd., ii. 179.

⁴ Loc. cit., pp. 105, 228, 229.

⁵ Murchison, Med.-Chir. Trans., xli. p. 16. See also Beaumont's Experiments in numerous instances.

of the stomach, like other tissues, acquires increased sensibility under the influence of disease, although the variations in its manifestation under these conditions are not always easily explicable. But there are at least two distinct methods through which painful sensations may be produced; and this distinction, when practical, is of some importance as a clue to treatment. In one class it may be referred to the direct agency of the sensory nerves of the mucous and submucous tissues; while in another, cramp or spasm of the muscular coat appears to be its determining cause; it must, however, be admitted that in a third variety, the coexistence of both of these cases becomes a matter of great probability.

The conditions of the stomach giving rise to pain may be summarily expressed as follows:—

1. The presence in its interior of foreign substances of an irritating character.
2. Organic diseases altering the anatomical structure of its coats.
3. Perversions of its secretions.
4. Perversions of innervation: (a) Proper to stomach; (b) Reflected from other organs; (c) Originating in the nervous centres.

1. As regards foreign bodies whose influence is purely mechanical, it is probable that they may excite pain in the same manner as was observed by Beaumont, viz. by causing spasmodic contraction of the pylorus, and pain of this kind, to which a similar explanation is applicable, is sometimes observed when indigestible articles of food have been taken. In the same category may be mentioned the abnormal presence of blood in large quantities, either swallowed or effused from the coats of the stomach, and of bile which has regurgitated from the duodenum.¹ Sharp substances wounding the coats of the stomach are also capable of causing pain of great severity,² arising in all probability from direct injury to its nerves. The corrosive poisons, such as the mineral acids, the caustic alkalis, arsenic, and antimonial preparations, probably give rise to pain (which is usually described as of a burning character) not only through direct injury to the nervous structures of the mucous membrane, but also through exciting inflammation of its coats.

¹ See Beaumont, loc. cit., p. 269.

² See a case quoted from Velpeau by Dr. Budd, of a fork swallowed; loc. cit., p. 276. Also a case by Mr. Marshall, where a number of pins were found in the stomach: Med.-Chir. Trans. xxxv. Also a case by Marcet (Med.-Chir. Trans. xii.), of a man who, on several different occasions, swallowed a number of clasp-knives.

2. Among the organic causes, the effect of *inflammation*—unless when caused by corrosive poisons, or when of great intensity, or complicated by aphthous ulcerations, hemorrhagic erosions, or implications of the peritoneal coat—is rather to cause uneasiness and distress than pain of a severe kind. The inflammatory process may, however, be accompanied by irritating secretions, or may be complicated by some forms of irritative neuralgia, or by spasmodic contraction of its walls, which greatly intensify the suffering arising from the original condition, and therefore the statement respecting the minor degree of pain attending this process requires to be received with a certain amount of caution.

Cancer and Chronic Ulcer of the mucous membrane are, on the other hand, the most frequent sources of severe and continuous pain in the stomach. Their prominence in this respect is due to the implication of branches of nerves in the destructive processes, or (in the case of ulceration) in cicatricial contractions resulting from the cure of these; also to the irritating secretions by which they are so commonly accompanied, and to the irregular contractions of the muscular coat arising from the alterations in size and shape to which the stomach is liable from the cicatrices remaining after the healing of ulcers. There are, however, exceptional cases in which both these diseases may proceed to a fatal termination without any occurrences of the symptom in question.

In the same category may be mentioned diseases obstructing the pyloric orifice, which cause pain, both by the spasmodic muscular contraction through which the stomach endeavours to propel its contents into the duodenum, and also by the irritating products and the flatulent distension of the organ which result from the fermentation of the food. In some cases also, when these obstructions are caused by ulcers, either simple or cancerous, the effect of the originally painful affection is aggravated by its position.

3. The effect of perverted secretions in causing pain is evident, not only when these are of an acid and apparently irritating character, but also even when neutral fluids are regurgitated. In the latter case, and also perhaps to some degree in the former, it may be questioned whether the pain is due solely to the presence of the unhealthy secretion, or whether both are not the simultaneous expression of the same conditions of disordered innervation, though the relief that in some cases of pyrosis follows the ejection of the fluid would indicate that this may in some measure be the direct

cause of the abnormal sensation. When, however, pain results from acidity, it may be questioned whether this is not in part due to spasmodic contractions, resulting from distension by gas evolved during the fermentative process by which this is ordinarily produced.

4. The most difficult question connected with the subject of gastric pain is, however, that of how far it may be due to a spontaneous neurosis. This subject will be further considered under the head of those forms of dyspepsia of which pain forms a prominent symptom; but it may be remarked in this place that cases are comparatively rare in which it occurs uncomplicated by some form of abnormal secretion, or without spasm associated with excessive flatulence and acidity from indigestion.¹ There does, however, appear to be a small class of cases where pain of a purely neuralgic character is felt in the stomach, especially in hysterical and chlorotic women during the menstrual period, and also in hypochondriac individuals of the male sex who have been reduced by debilitating causes, and in both it not unfrequently appears to alternate with neuralgic pains in other parts.² Such pain is also liable to occur in patients of a rheumatic and gouty diathesis;³ while in others its regular intermitting character raises the suspicion of its being due to a malarial poison.⁴ It appears also to be probable that spasmodic contraction of the coats of the stomach, analogous to cramp of the voluntary muscles, and attended with severe pain, may, in patients of the two first-named classes, be excited by the mere entrance of food into its cavity. The distinction between this form and that arising from undue excitability of the sensory nerves of the organ is practically one of great difficulty. One remarkable feature, which greatly assists the diagnosis of its nervous origin, is that in many of these cases the digestion in the intervals of pain appears to be entirely unaffected.

One very important fact has, however, been pointed out by M. Briquet,⁵ viz., that pain of this character, which has been described by previous writers as existing in the stomach, has frequently its

¹ Frerichs, art. *Verdanung*, loc. cit., found, in the matters vomited by chlorotic women, abundant evidence of the acid decomposition of starchy food.

² See Andral, *Clin. Med.*, ii. 297.

³ See several cases of this kind in Whytt, *On Nervous Disorders*. Also Romberg's *Personal Experience*, loc. cit. 129.

⁴ Andral, loc. cit. 129. Also Niemeyer, *Lehrbuch Path. Therap.*, ii. 545; Chambers' *Indigestions*, p. 148. The latter author remarks that pain in the stomach, when due to this cause, is not excited by food, nor accompanied by tenderness at the epigastrium.

⁵ *Traité Clinique et Thérapeutique de l'Hystérie*, 1859, p. 216 et seq.

exclusive seat in the abdominal muscles, and belongs to the class of affections termed by him myosalgia, and corresponding to the myalgia of Dr. Inman.¹ It is distinguished by a superficial tenderness, which is sometimes very intense, and is capable of being elicited by a degree of pressure insufficient to affect the abdominal viscera; by its preferential seat in the left rectus and obliqui abdominis; by its existence, not only in their fleshy parts, but in their attachments to the ribs, where moderate pressure cannot affect the stomach; by its not unfrequently extending to the pectoralis major; and in all these cases by its occurring chiefly in the left side, and by its frequent independence of the digestive acts. This pain frequently occurs together with severe dorsal pain (the rhachialgia of Briquet), which is most common between the sixth and eighth dorsal vertebræ, and which may be distinguished by tenderness on pressure on the apophyses of the vertebræ, and along the vertebral groove. Briquet is of opinion that the abdominal pain (to which he gives the term epigastralgia) may be induced by sympathy, or in a reflex manner, when the stomach is affected;² but there appears little doubt, from his researches, that it can exist in an independent form, and that it has been a frequent source of fallacy in observations recorded on the subject of hysterical gastrodynia.

The fact, however, which Bamberger recalls should not be lost sight of, that chlorotic and anæmic women are not unfrequently the subjects of gastric ulcer, which may at times run its course unattended by the more prominent symptoms which usually characterize this disease. The occurrence of severe abdominal pain in such cases is always a matter of suspicion, and requires caution in treatment. On the other hand, I have met with unequivocal tenderness on superficial pressure in the vertebral groove and in the abdominal muscles in cases where there was severe dorsal and epigastric pain, attended with other and unequivocal symptoms of the presence of ulceration.³

Another question which must yet be regarded as undecided, in cases of pure neuralgia of the stomach, is that relating to the nerves

¹ Spinal Irritation; Foundation for a New Theory, etc.

² This opinion is to some degree corroborated by Bernard's observation, that pricking of the solar plexus, and of the semilunar ganglion, caused involuntary movements of the pectoral and abdominal muscles, and also of the diaphragm. (Lec. Syst. Nerv., i. 368.)

³ Traube has noticed both hyperæsthesia and anæsthesia of the cutaneous surface in cases of ulcer of the stomach. (Deutsche Klinik, 1861, p. 63.)

involved, and to the peripheric or central origin of the affection. Romberg divides these neuralgias into two classes, those of the solar plexus and of the vagus, and distinguishes the former by the attending sense of faintness, while the latter is often marked by perversions of appetite; but the variety in the symptoms, and the difficulty even in the diagnosis of the primary nervous affection, renders this test apparently unreliable.¹ There can be little doubt that in many cases, especially of chlorosis, the neuralgia is a part of a general condition, disappearing as it does on the improvement of the state of the blood.² Direct evidence of pain of this class originating in the central organs of the brain or cord, is only rarely afforded,³ though the absence of any other demonstrable cause may at times lead to the suspicion of such a mode of causation.⁴

Further, it is to be noticed that, as in the case of vomiting, many of the painful affections of the stomach originate in reflected sensations having their origin in distant organs. Among those which stand in the most frequent causal relationship to this character must be mentioned the uterus and ovaries: many severe cases of gastrodynia are directly connected with disturbances of the menstrual function, and cease on the restoration of this to its normal condition.⁵ Gall-stone, and diseases of the duodenum, and abdominal aneurism⁶ are also frequent causes of pain, where the participation of the stomach is shown by the vomiting which attends the other phenomena present.

Diseases of the heart and lungs, and especially pericarditis,⁷ are also not unfrequently causes of epigastric pain, which may in some cases, especially of the last-named affection, constitute their chief symptom.

DIAGNOSIS.—There is no writer on the diseases of the stomach who has not confessed to the difficulty of forming in all cases an accurate diagnosis regarding the origin and import of sensations

¹ It may be noted, however, that Bernard found that, after section of the pneumogastric nerves, the mucous membrane of the stomach was insensible to pinching. (*Loc. Syst. Nerv.*, ii. 424.)

² See Bamberger and Niemeyer, *loc. cit.*

³ See, however, a case given in the chapter on Nervous Disorders of the Stomach, where epigastric pain as well as vomiting, without disease of the stomach, occurred in connection with hemorrhage of the brain.

⁴ See a case by Bamberger, *loc. cit.* 168. Also Andral, before quoted.

⁵ Niemeyer cites a case where the attacks of gastrodynia only returned at the menstrual period. (*Loc. cit.* 545.)

⁶ Lebert, *Handb. der Sp. Path. Therap.* (Virchow), vol. v. Abth. ii. p. 53.

⁷ Andral, *Clin. Méd.*, ii. 148.

which, though similar in character, may have such varied and essentially different modes of origin; and the records of errors in diagnosis freely admitted by the most competent observers abound in medical literature.

The chief difficulty lies in the discrimination of pain of purely neuralgic character from that which exists in cases of ulcer, and in the early stages of cancer, and a satisfactory conclusion can be formed only by a very careful investigation of the ætiological circumstances attending each individual case. Even with regard to these, exceptional conditions are so frequent as to invalidate almost every general rule that can be laid down.

Purely neuralgic pain is more common in the earlier periods of life after puberty, and especially in the female sex, and is then often attended with other nervous phenomena: but, as has been remarked before, these patients are very liable to ulcer of the stomach.¹ On the other hand, at more advanced ages, cancer may exist for years without any other symptom than violent gastrodynia, which may be completely intermitting in its character, and may be unattended in the intervals of the attacks by any appreciable disturbance of the digestive functions.

The relation of the pain to the state of the stomach with regard to food may often, however, as pointed out by Abercrombie, afford indications of some importance. Thus pain experienced when the stomach is empty is less common in ulcer and cancer than in the neuroses; while that following the ingestion of food has a gravity inversely proportioned to the time which may elapse before the pain is felt. This, if occurring late, may be due to flatulence; though here the possibility of pyloric obstruction should warn us against a too hasty diagnosis. As a general rule it may be stated that even in the absence of hæmatemesis or of signs of pyloric obstruction, pain of great severity occurring early and continuing long after the ingestion of food, especially when associated with vomiting, and when combined with pain in the spine or scapular region, is always to be regarded with grave suspicion of its origin in organic disease.

The indications obtainable by the effects of pressure in causing tenderness or the aggravation of pain already existing, though of some approximate value, are not such as can be certainly relied

¹ Whytt, and other writers on nervous disorders, mention vomiting of coffee-ground matters among the symptoms of nervous gastrodynia.

on as an absolute test of the nature of its cause. The uneasiness and pain caused by subacute or acute inflammatory action is almost invariably aggravated by this procedure, as is also that arising from ulcer and cancer. In cases, however, of the last-named diseases, much depends on the position of the lesion in the anterior or posterior walls of the stomach, and exceptional instances are recorded where even in these firm pressure has afforded relief. Purely nervous pain, on the other hand (independently of cases of superficial tenderness in the abdominal wall), is sometimes increased by gentle but relieved by a firmer pressure; and pain from flatulent spasm is often markedly alleviated in the same manner.¹

Some other affections, which may simulate gastric pain, deserve also a brief notice in this place.

Pain, in the course of the transverse colon, is among the most frequent of these, and it is often associated with an amount of flatulent distension which may add greatly to the difficulties of diagnosis of its seat. There is, however, generally a distinct difference, especially on gentle percussion, between the notes to be elicited from the two organs, that arising from a distended colon being the less prolonged, and having a higher pitch. Pain from this source is seldom so much felt at the ensiform cartilage as in the right or left hypochondriac regions, and it frequently extends in the direction of the sigmoid flexure. It is also associated with colicky pains and irregular contractions, which may be seen or felt by the hand, together with borborygmi, distension, and other signs of intestinal flatulence, and with migratory pains in other parts of the abdomen.

Rheumatic pains in the abdominal muscles are another source of fallacy,² which can be best distinguished by their superficial character and by tenderness on pressure and by pain excited by movement.

Numerous instances, again, have been quoted by various writers, of epigastric pain depending on functional or organic diseases of the spinal cord. In the former class of cases, when affecting the skin, this is distinguished by the very superficial tenderness (which

¹ Miquel has advanced the not improbable explanation that the relief thus experienced may be due to the effect of pressure in restraining the movements of the stomach. (*Zeitsch. Hannover Heilk.* 1864, p. 17.)

² Bamberger, loc. cit. 171.

disappears on deeper pressure¹) by the discovery of other painful points in the course of the nerves affected, by the absence of all symptoms referable to the stomach, and by the coexistence of an hysterical diathesis: the distinctive characters of pain residing in the muscles have been already referred to. In the latter case the presence of spinal tenderness, as ascertained by cold, heat, pressure etc., the coexistence of some perversions of the functions of sensation or of motor power in the lower extremities, and even in the absence of the latter, the symmetrical character of the affection² and the relief by rest, will generally suffice to indicate (in the absence of symptoms referable to the abdominal viscera) the nature of the affection.

VOMITING.

Vomiting is a complex act, involving muscles which are widely separated from one another, and which are supplied by nerves whose central origins have very little in common. In its occurrence there is a participation of the abdominal muscles, of the diaphragm, and of the other respiratory muscles, as well as of the stomach, the œsophagus, the pharynx, and the larynx; and, as Bamberger has remarked, the part taken by each of these factors varies considerably, both in the order of their occurrence and in their influence on the process. Thus, as Magendie and Budge³ have shown, the influence of emetics may give rise to the expulsion of food from the stomach through the action solely of the diaphragm and of the abdominal muscles; while, when an irritant is directly applied to the pyloric orifice, its contractions precede those of other parts; on the other hand, when vomiting is excited by irritation of the fauces, pharyngeal movements appear as the first among the series, though the reverse is the case under other circumstances.

Without entering into the details of the mechanism of the expulsive process (which belong more exclusively to the domain of physiology), it is important, from a clinical point of view, that

¹ This is, however, a peculiarity of some forms of pain undoubtedly originating in the stomach, and cannot therefore be relied upon.

² Hilton, Lectures on Rest and Pain, pp. 79, 80.

³ Die Lehre von Erbrechen.

vomiting should be regarded as being capable of originating from stimulation either of the central or of the peripheric extremities of the nerves supplying the parts which participate in the act, and also from irritation of other parts whose central connections with those more immediately concerned can only be inferred from the phenomena witnessed.

It appears, therefore, that vomiting, like many of the symptoms which have been previously considered, may be due to other influences than those directly affecting the stomach; but, on the other hand, as these are its most frequent causes, it is not unimportant briefly to review the chief of the conditions from which it may arise.

These, for convenience, may be divided into the two chief classes of vomiting from central and from reflex causes; and the latter may be again distinguished into (a) the cases when it arises from peripheric stimulation of the stomach and fauces, and (b) those in which it appears among phenomena resulting from the irritation of other and distant parts.

(a) The effect of irritation on the upper part of the tract is so well known as only to require a passing allusion. In the stomach the necessary conditions of irritation may be produced by direct pressure artificially exerted on the epigastrium, or caused by the enlargement or displacement of contiguous organs, and especially of the liver. They may also depend on matters introduced or formed in its cavity, or on the implication of its nerves in diseased processes by which the organ is affected. Thus vomiting may be excited by irritant substances of all kinds, especially the corrosive poisons, the effects of many of which persist after the cause has been removed, owing to the production of organic alterations of an inflammatory or ulcerative character in the mucous membrane. It may also arise from accumulations of materials formed by the stomach, or introduced into it, which are incapable, either from their nature or their amount, of undergoing the normal digestive process, such as mucus, excessive acid, bile, and blood (whether proceeding from the stomach, or swallowed after having been effused from the lungs, nose, or fauces). In this category may also be placed the vomiting from over-distension which occurs with such frequency in suckling children, and which is, however, greatly facilitated by the form and position of the organ in the

earlier period of life.¹ Most of the organic diseases of the stomach, though differing widely in their nature, have also this disturbance in common, though the immediate cause of its production is often as varied as the anatomical conditions in which it originates. In some it is due to enormous accumulations of food resulting from obstructions of the pyloric orifice;² in others, as in inflammatory affections of the peritoneal and mucous coats, it is caused both by the direct irritation excited in the peripheric nerves, and also (in the case of the latter) by the altered secretions which are the result of the process; while all these causes may, with the addition of hemorrhage, concur in giving rise to vomiting in cancerous and ulcerative affections of the organ, or in the rarer cases in which a portion of its coats has been incarcerated as a hernia in the abdominal parietes.³

(b) The influence of peripheric irritation of distant parts, when the exciting cause acts (to retain Bamberger's term) by irradiation, also requires a passing mention.

Some of these agencies, however, though placed in this category, may perhaps be referable to anastomoses between the pneumogastric nerves and those supplying the parts whence the irritation proceeds. Of this kind are cases where vomiting occurs in connection with hepatic abscess,⁴ or from the impaction of a gall-stone in one of the ducts of the liver,⁵ or in cases of peritonitis; or of ulceration, invagination, herniæ,⁶ or other obstructions of the in-

¹ Schultze describes the stomach of the infant as resembling in form that of the carnivora, while in the adult it approximates far more to the type of the herbivorous classes. In the former the position approaches the vertical, and the shape is conical; the œsophagus is placed at the left extremity, opposite to the pylorus; the lesser curvature is lengthened, and the greater curvature shortened; while, in the adult, the latter is proportionally increased, and the fundus developed into a sac, to the right of which the œsophagus is inserted in closer proximity to the pylorus than in the child. Hence the contents in the child are propelled in directions passing almost straight from the œsophagus to the pylorus, and *vice versa*; while, in the adult, the antiperistaltic movement propels the food, not towards the œsophageal opening, but into the sac of the fundus. (Hufeland's Journal, 1835, No. 3, quoted by Hensch.)

² It must be remembered also that a spurious form of vomiting is associated with obstructions of the cardia, owing to the retained food being regurgitated from the distended œsophagus.

³ See a case quoted by Dr. Walshe, "Cancer," p. 292. Also one by Mr. Moore, Med. Chir. Trans. xvi. I have recently seen a similar case under the care of my friend Dr. Reynolds. It presented this peculiarity, that vomiting was long arrested under the influence of opium.

⁴ Budd, Stomach, 192.

⁵ Ibid.

⁶ Bamberger remarks that a sudden invasion of vomiting, attended with pain and distension of the abdomen, should always excite a suspicion of hernia. (Loc. cit. note, 184.)

testines,¹ or of simple fecal accumulations in these viscera; or of epiploic herniæ,² which have escaped into the groin or through the umbilicus, and give rise to irritation of the stomach, through dragging on the greater curvature. Here also must be mentioned those instances where vomiting occurs in connection with disorders of the respiratory apparatus, as in the invasion of pneumonia³ and bronchitis, or after violent paroxysms of coughing, as in phthisis⁴ and whooping-cough, or through irritation of the external ear.⁵ In other instances the connection is not apparent or explicable by any anatomical relations with which we are acquainted, as in vomiting from renal colic, injury to the testicle, diseases of the uterus⁶ and ovaries, or pregnancy. Caution must, however, be exercised in attributing all cases of vomiting which occur in connection with the last-named condition solely to disturbed innervation, as in some cases the symptom has been found associated with ulcer,⁷ and in many others there is so considerable an alteration in the secretions and functions of the stomach, that, although post-mortem evidence has in some instances failed to reveal appreciable organic alterations, it is nevertheless difficult to eliminate the possibility of their existence.⁸

¹ Andral, Clin. Méd., ii. 174. I have lately met with a case where ulceration of the large intestines was attended with such constant vomiting as to have given rise to the suspicion of ulceration of the stomach.

² Chomel, Des Dyspepsies, pp. 133, 134, quotes Pipelet (Mém. de l'Acad. de Chirurgie) as the discoverer of these herniæ. He says that they are very small, and are recognized by the facility with which they can be reduced, but that they cannot be retained *in situ* by the ordinary truss, and that for this purpose a small hemisphere of ivory or wax, fastened by diachylon, is the best means to be employed.

³ Chomel, loc. cit. 132, points out that a long-continued rigor in old people, attended with vomiting, is often the precursor of an attack of pneumonia. The diagnosis is aided by the fever, prostration, and pain in the back.

⁴ Vomiting in phthisis, or from disease of the lungs uncomplicated with that of the stomach, is in my experience comparatively rare, except in the cases where it is directly brought on by efforts of coughing, or by tough mucus adhering to the upper part of the pharynx. It is, however, occasionally met with as a very early symptom of the disease. It has appeared to me to be the most common in the female sex, but I have also seen it in men.

⁵ Pechlin and Arnold, quoted by Romberg; Sieveking's Trans., Syd. Soc. Ed. ii. 17.

⁶ In a case related by Gooch, from Denman's Experiences, vomiting followed each attempt to tighten a ligature passed round an inverted uterus, but ceased as soon as the ligature was slackened. (Dis. of Women and Children, by Ferguson; New Syd. Soc., p. 137.)

⁷ Hodgkin, Diseases of Mucous and Serous Membranes, ii. 371, quoted by Bamberger. The nervous character of the vomiting associated with many of these causes, is, however, in some measure shown by its occurrence on the assumption of the erect posture, and by its ceasing when a recumbent position is assumed, as well as by the manner in which it can frequently be checked by taking small quantities of food before rising.

⁸ See Acute Catarrh.

Vomiting arising from derangement of the nervous centres may be subdivided into three classes: (1) Cases where it is associated with anatomical lesions, or disturbances in the circulation of these parts, and especially of the brain; (2) Those resulting from the effect of toxic agents on the brain or cord; and (3) Vomiting, whose functional origin may be inferred either from its evident association with other nervous disturbances belonging to this class, or from certain peculiarities in the concomitant symptoms, or from its existence under conditions for which no other adequate explanation can be found.

The frequency with which the symptom in question is associated with organic diseases of the brain has been remarked by all writers since the days of Abercrombie, who pointed out that it not unfrequently happens that the symptoms of the primary disorder are masked or obscured by those proceeding from the stomach, among which vomiting is often the chief and most characteristic.

Thus, it appears among other nervous phenomena in cases of suddenly induced cerebral anæmia,¹ and in other cases where the condition is not as yet fully elucidated, as in some cases of commencing paralysis after diphtheria,² but where, from the simultaneous affection of the heart and pharyngeal muscles, there is reason to believe that some lesion of the central roots of the par vagum is present. Further, it is a frequent complication of concussion of the brain; and Sir B. Brodie³ has remarked that it followed the elevation of depressed portions of the skull in the operation of trepanning. It would, however, appear from an examination of Abercrombie's recorded cases, that there is hardly any disease of the cerebral centres with which vomiting may not be associated, either at its outset, or even throughout its entire course,⁴ though the persistence of the symptom under these circumstances is more common as a complication of meningeal irritation or of tumor than in cerebral softening or hemorrhage. Its frequency in tubercular meningitis is indeed so well known that it would only require a passing notice in this place, were it not for the difficulty which sometimes exists in distinguishing vomiting from this cause from that arising from disordered conditions of

¹ Marshall Hall in *Med. Chir. Trans.* xlii.; Kussmaul and Tenner, on *Convulsions*, New Syd. Soc., pp. 28, 30.

² Sir W. Jenner, on *Diphtheria*, p. 42.

³ *Med. Chir. Trans.*, xiv. 355.

⁴ The part of the brain affected appears to exert little or no influence in determining the occurrence of this symptom.

the stomach, and for the consequent danger of thus overlooking the onset of the graver disease in the more prominent symptoms of the lesser malady; and more particularly as in some cases of this disease other symptoms of gastric disturbance may be present.

Generally, however, it may be noted that vomiting, arising from the stomach, is attended with more or less pain, with a furred tongue, with constipation or diarrhoea, load at the stomach, and is preceded for a long period by a sense of nausea.

The vomiting from cerebral causes, on the other hand, usually presents an absence of these symptoms, or at least, when present, they are much less marked than when the cause resides in the stomach. This is especially true of the nausea; and its absence as a precursory symptom, especially when the tongue is clean, should always raise grave suspicions of the nature of the affection to which the vomiting is due.¹

In some cases of apoplectiform attacks, whether from softening or hemorrhage, the first symptoms are faintness and vomiting, and it is only at a later period that more distinctive phenomena make their appearance. In others, the vomiting may be so violent and persistent, that, though associated with nervous disturbance, the true nature of the affection may be overlooked. A case of this nature occurred to the author, in a boy who was brought into the Edinburgh Infirmary, suffering from violent and repeated vomiting, and with a history that he had eaten a large quantity of decayed oranges, to which this symptom, together with his semi-comatose condition and the epileptiform convulsions, which occurred from time to time, were for some time attributed, but in whom cerebellar hemorrhage was discovered after death, which occurred within six hours.² Pain in the head is so frequently associated with disturbances of digestion, and under the name of sick-headache is so constant a concomitant of the affection in question, that this symptom is of less value as a criterion of the existence of disease of the brain than might at first sight be supposed, especially as, when it occurs, even in cases of simple indigestion, it is frequently attended with some disturbance of vision, and with considerable intolerance of light. The vomiting of cerebral origin may, however, often be distinguished by its occurrence at irregu-

¹ Andral, *Clin. Méd.*, v. 212.

² Abercrombie's *Second Form of Apoplectic Attack*, p. 204.

³ This case is recorded in Dr. Bennett's *Princ. and Pract. Med.*, p. 406.

lar periods, and by efforts at retching which are frequently independent of the presence of food¹ in the stomach. Romberg² gives the following criteria for the discrimination of vomiting of cerebral origin:—

1. The influence of the position of the head: the vomiting is arrested in the horizontal, and recurs and is frequently repeated in the erect position.

2. The prevailing absence of premonitory nausea.

3. The peculiar character of the act of vomiting: the contents of the stomach are ejected without fatigue or retching, as the milk is rejected by babies at the breast.

4. The complication with other phenomena, the more frequent of which are pains in the head, constipation, and the irregularity of the cardiac and radial pulse, which is increased during and subsequent to the act of vomiting. The value of some of these has, however, been disputed by later writers,³ and the accuracy of the diagnosis must, in many cases, depend on a careful comparison of the predominance of one or other of the symptoms present, though it can occasionally only receive its full confirmation on the appearance of other and more unmistakable symptoms of disturbed innervation.

The following table exhibits the points of contrast here detailed:—

GASTRIC VOMITING.		CEREBRAL VOMITING.	
EPIGASTRIC PAIN AND TENDERNESS.			
Common, and in some cases very marked.		Rare.	
NAUSEA.			
Constant.		Frequently absent.	
OPPRESSION AND WEIGHT AT EPIGASTRIUM.			
Constant.		Rare.	
BOWELS.			
Condition variable.		Constipation.	
TONGUE.			
Loaded, except in some cases of cancer and ulcer, where other of the above symptoms exist.		Often clean.	
HEADACHE.			
Less intense. Chiefly frontal. Invasion gradual. Relieved by vomiting.		Often violent. Invasion sudden.	

¹ Abercrombie, Path. and Pract. Researches on Diseases of the Brain and Cord, ed. 1834, p. 87.

² Loc. cit.

³ Hensch, II. 232.

GASTRIC VOMITING.

CEREBRAL VOMITING.

VERTIGO.

Comparatively rare. Relieved by vomiting.

Very frequent. Not relieved.

OTHER NERVOUS PHENOMENA.

Only rarely present, and then only in slighter forms, and relieved by vomiting.

Indistinctness of vision, or diplopia. Confusion of ideas. Loss of memory. Not relieved by vomiting. Anæsthesia or paræsthesia, paralysis or cramp, convulsion, and coma, common, or soon supervene.¹

The toxic agents capable of exciting vomiting by their action on the nervous centres must only here be briefly passed in review. Among them are to be mentioned tobacco, digitalis,² opium, cyanide of potassium applied externally,³ lobelia, and the vapour of chloroform. Magendie's often quoted experiment, which demonstrated the possibility of exciting vomiting, after the removal of the stomach, by the ingestion of tartar emetic into the veins, would show that this agent may probably be placed in the same category—especially since Budge⁴ has shown that, after removal of the hemispheres of the brain, the administration of this drug is not followed by vomiting.

Closely allied to the effects caused by poisons of this nature in the production of vomiting, is the occurrence of this symptom in connection with various disorders of the blood, and regarding the nature of which association we are still in ignorance. It may indeed be a doubtful question (as has already been stated, and to which allusion will be made hereafter) whether, in many of the acute disorders in which this symptom occurs, organic alterations of the stomach are not present to a degree sufficient to account for its occurrence; and, in others, whether the elimination of some morbid material by its secreting surface may not be considered as the direct exciting cause. Under this head may be placed the vomiting which occurs in Bright's disease, where the demonstrated presence of urea in the contents of the stomach may possibly be held to explain the disorder in its function, but where also there is

¹ Before quitting this subject it may be desirable to recall an interesting case, quoted by Romberg, from P. Frank, of a patient in whom, after suffering for years from nausea and vomiting, the vagus nerve within the thorax was found pressed upon by "steatomatous" tumors.

² Clarus, *Arzneimittellehre*, 596. Andral, *Path. Int.* i. 147, says that digitalis will produce this effect when introduced into the rectum.

³ Andral, v. 270.

⁴ Quoted by Henoch, ii. 336.

not unfrequently considerable evidence of irritation or subacute inflammation affecting the mucous membrane. So also in many other febrile and inflammatory affections, especially at the outset of pneumonia, and at the commencement and termination of typhoid fever,¹ the question whether the vomiting be due to nervous disturbance, or to the participation of the stomach in changes induced by the febrile condition or by some common cause of blood-poisoning, must be considered as still in abeyance. In scarlatina, the symptom is often a very prominent one, and a case occurred to the author, in which, during a delay in the appearance of the eruption extending over a period of four days, the only symptoms present were an intense general febrile condition, associated with uncontrollable vomiting, which ceased on the appearance of the eruption. In this disease, however, the recent researches of Dr. Fenwick have shown that there is an almost constant affection of the stomach of an acute inflammatory or catarrhal nature, and that the vomited matters contain casts of tubes;² it is also probable that the vomiting of cholera is due to a very similar cause.

Probably, however, the occurrence of vomiting in the cold stage of intermittent fevers³ can only justly be attributed to a nervous origin, as also when it is associated with disease of the suprarenal capsules.

The functional disturbances of the nervous centres associated with this symptom are also numerous and manifold. It may be produced by emotional causes—by shock, or fright, or fear. It is also a frequent attendant of the hysterical condition, in which it often occurs in a very uncontrollable form. In this affection it is often distinguished by its being unattended by any other evidence of gastric disorder, the tongue being clean and the appetite good, though occasionally depraved; it is remarkable, also, that in many of these cases there is very little emaciation or loss of strength during its continuance, and its origin can usually be ascertained by its being associated with, or by its having superseded, other nervous disturbances of a more or less distinctly hysterical character.⁴

Affections of the senses not unfrequently give rise to the symptom. Thus it may be produced by severe pain, or may be caused

¹ Murchison, *Treatise on Continued Fevers*, pp. 438, 478, 506. ² *Loc. cit.*

³ Henoeh, *loc. cit.*, ii. 337. Habershon, *Obs. Alim. Canal*, p. 140.

⁴ See Andral, *Clin. Méd.*, ii. 196, 199.

by a nauseous or disgusting taste or smell, by bright light, and especially by the sight of objects in motion—under which head it is probable that sea-sickness is to be placed; for this affection, if not entirely due to this cause, is very largely influenced by it, and can frequently be averted by steadily keeping the eyes shut when the body is maintained in the recumbent position. The mere feeling, however, of some peculiarities in the movement of the body may also give rise to a similar train of phenomena closely allied to sea-sickness, of which swinging, or riding backwards in a carriage, affords very frequent instances.

The indications obtainable from the vomited matters require, in relation to the special object of this work, to be only very briefly passed in review. Thus food may either be returned unaltered, as in some cases of nervous vomiting, where it is ejected almost as soon as it is swallowed; or it may present evidences of fermentative changes, varying with the length of time during which it has been delayed in the stomach, but which more particularly affect the starchy substances. These are in some cases changed into a tenacious, glutinous material, resembling some of the products derived from the lactic acid fermentation,¹ while in others they are found to be frothy from the evolution of carbonic acid, and associated with the formation of large quantities of the *Torula cerevisiæ*.² In other instances alcohol³ has been found, together with amylic alcohol and the butyric, lactic, and acetic acids. These changes occur in the most extreme degree when the food is delayed in the stomach by obstructions at the pyloric orifice, under which circumstances the *Sarcina ventriculi* of Good-sir is found in the scum which rises on the surface. This growth assumes the form of oblong plates, divided by dissepiments into four secondary, sixteen tertiary, and sixty-four elementary rectilinear cells, which measure from $\frac{1}{800}$ to $\frac{1}{1000}$ of an inch along each of their sides, and from this arrangement it received the name of *sarcina*, or woolpack, given to it by



¹ Frerichs, in Wagner's Handw. der Phys., art. "Verdauung," p. 804.

² Ibid.

³ Graham, quoted by Jenner, Med. Times and Gaz., Aug. 1851, p. 192; also Schulzen, Arch. Anat. Phys., 1864, pp. 491-498.

its discoverer.¹ Its appearance is, however, by no means diagnostic of pyloric obstruction, as it is found in other diseases of the stomach. Thus it has been met with in cases of direct injury to this viscus,² and in some instances where digestion was probably affected by impaired innervation and when no lesion of the organ has been discoverable,³ as well as in some cases of catarrh.⁴ It has also been observed in other tissues and fluids of the body;⁵ and it is a question whether, though formed during the fermentative process, it is really capable of setting up this action.⁶

Independently of food, other matters vomited are sometimes of value in the indications which they afford of disease of the stomach. Thus mucus is almost invariably an evidence of catarrhal conditions; while with respect to other fluids, whether acid or alkaline, the chief conditions under which they are secreted have been already alluded to under the heads of Pain and Acidity.

Bile commonly appears whenever the straining is long and violent; it is not therefore indicative of any special disease, though its presence in the stomach may retard the digestive process.

Pus, as such, does not appear to be formed in the stomach, except in those rare instances where suppuration takes place in the sub-mucous coat; its presence in vomited matters therefore indicates that it has been formed in the œsophagus, or has entered the stomach from some external source.⁷

¹ Ed. Med. Surg. Journ., vol. lvii. The growth appears to be identical with the *merismopædia punctata* (Mettemius, Zeitsch. Rat. Med., vii. 335). It is termed *Merismopædia ventriculi* by Robin.

² Mr. Busk, Microscop. Journ., 1841, i. 321; Sir W. Jenner, Med. Times and Gaz., 1861, ii. 192. Sir W. Jenner's case was probably one of coarctation of the pylorus resulting from ulceration.

³ Busk, loc. cit.; Dr. J. W. Ogle, in a case of tubercular meningitis, Trans. Path. Soc., vi. xvii.

⁴ Dr. Bence Jones in a case of vomiting from albuminuria, Path. Soc. Trans., iii. 328.

⁵ In the lungs by Virchow, Forstle's U. Notizen, 1846, in 285 Archiv für Path. Anat., x. 401; and by Zenker, Zeitsch. Rat. Med. N. F., iii. 117. In the urine by Heller, Archiv Chem. Microscop., 1847, 1852; also in the pelvis of the kidney and in the bladder, by Mr. Hepworth, Microscop. Journ., v. 2, 3; and in the bile by Dr. Lionel Beale (quoted by Dr. Budd, Dis. of Stomach). It has recently been observed in the blood by Dr. Ferrier, Brit. Med. Journ., 1873, i. 98, and termed by him *Sarcina sanguinis*. Dr. Ferrier appears to think that it is primarily developed in the blood, and thence exuded into other parts. Dr. Bastian, lb., and "Beginnings of Life," considers sarcinae to be destitute of organization.

⁶ Virchow, Archiv, i. 271; also Dr. Ferrier, U. Kühne, Lehrbuch der Phys. Chemie, p. 59, says that he has kept sarcinae with vomited matters, and also with solutions of sugar, for days without the slightest development of gases ensuing.

⁷ See a case of this nature where pus was vomited from a fistulous communication between the œsophagus and pericardium, Dr. Chambers' Indigestions, p. 175. The same author says that he has seen this product in matters vomited in cases of cancer of the œsophagus and cardia.

Vomiting of foreign products, as worms or echinococci, are among the rarities of medical literature; in the case of the latter their appearance would most probably be indicative of a communication having been established between the cavity of the stomach and an echinococcus cyst in the liver.

It is believed by some practitioners that cancer cells can be distinguished among the products of vomiting when the disease affects the stomach. I know of no authentic instance where such an observation has been made of an indubitable kind; while the improbability that any portion of a cancer would be separated in a condition in which its cells would still present their distinctive characters, coupled with the fallacies presented by the appearances of swollen epithelial cells, from the stomach and mouth, or from the pharyngeal or œsophageal surfaces, should cause such evidence to be received only with the greatest care and caution.

Dr. Quain and Mr. Beardsley have, however, recorded a case where a polypoid growth, similar to those ordinarily found in the stomach, was ejected entire,¹ but the pedunculated character of these formations would allow of their separation with much greater ease than in the case of cancers, portions of which are ordinarily only removed by sloughing processes which destroy the characteristics by which they can be recognized.

Fæcal vomiting can as a rule only occur under conditions either of direct communication of some portion of the intestine (usually the colon) with the stomach, or as the result of obstruction to the passage of the feces through the intestines; Briquet has, however, recorded a case, observed under circumstances where the fallacies arising from imposture were carefully avoided, of an hysterical patient who speedily vomited matters introduced into the rectum.²

Vomiting of blood, or hæmatemesis, will form the subject of a special chapter.

INDIGESTION.

Indigestion (or *dyspepsia* or *apepsia*) constitutes the most important of all the aberrations from the healthy functions of the stomach. By these terms are signified any retardation or perversion of the

¹ Trans. Path. Soc., viii. 219.

² Loc. cit., p. 315.

changes normally undergone by the food in its process of conversion into a state suitable for the nutrition of the organism. The indications of this defect are of very various kinds, and may be reduced to the classification previously given, under which the various symptoms arising from stomach disorders are capable of being included.¹ Many of them which are referable to the stomach and intestinal canal are both objective and subjective in their character; others, again, consist in perversions of the functions of the nervous system; while a third class, which may truly be termed secondary, are the consequences of mal-nutrition in distant parts, arising from depravation or insufficiency in the supply of nutritive material, caused by the imperfect elaboration of the food in the primæ viæ.

Hence, when viewed as a whole, the indigestion of food can only be regarded as a symptom revealed to us by a series of phenomena some of which are the primary results of the imperfect changes in the alimentary substances, while others again are the more or less remote effects of these. The former, though varying within certain limits, according to the nature of the food, are common to all forms of indigestion however originating, and consist chiefly of the fermentative and putrefactive changes to which allusion has been already made. Although therefore of great importance as indicating the existence of this state, they are yet only secondary in diagnostic value to those symptoms through which the state of the stomach in which they primarily originate can be distinguished, and on the recognition of which any successful attempt at a pathological classification, and consequent diagnosis, must depend. The distinction is not indeed always an easy one, since the acids and gases produced by the alterations in the food almost constantly give rise to other secondary disturbances in all the chylopoietic viscera, which in some cases, and especially through the pain which they produce, are liable to be confounded with those originating in morbid states of these organs. Still, however, the separation of these classes is practically so important, that it is desirable as far as possible to maintain it, though it may be difficult to determine in which category any single symptom is to be placed when regarded apart from the whole group with which it is associated.

In such a mode of arrangement the symptoms arising directly

from abnormal changes in the food—such as acidity, flatulence, eructation, distension of the stomach and intestines with gas, borborygmi, and alterations in the fecal evacuations—serve as evidences of abnormal fermentative processes, the nature, causes, and effects of which have been already discussed. Those, on the other hand, which may be regarded as more direct signs of disturbance of the stomach (though sometimes only resulting from the former), are weight, uneasiness, sinking, craving, emptiness, or pain of different degrees of intensity, appearing either when the stomach is empty, or at variable periods after the ingestion of food. With them also must be placed affections of the appetite and thirst, either on the side of excess or deficiency or perversion; and in the same category must be included symptoms arising in parts which are more remote, but yet form part of the gastro-intestinal canal, as the tongue, mouth, salivary glands, and fauces. Or the condition may only be revealed by symptoms appearing in other organs, the connection of whose disorders with that of the stomach has been spoken of as being of a secondary nature, and which may be enumerated according to the parts in which they occur, viz.:—

Disturbances of the Nervous System, indicated by neuralgic pains of the thoracic and abdominal muscles, weakness and weariness, or painful aching in the limbs; by headache, vertigo, perversions of vision, impaired intellectual activity, loss of memory, depression of spirits, anxiety, fear, morosity or irritability of temper, or, by the various forms of hypochondriasis, melancholia or hysteria; or, in some instances, by convulsive attacks.

Alterations in the urinary secretions, consisting sometimes of excess of watery fluids, or of urea; sometimes of diminution of the total amount, associated with lateritious sediments;—or of variations in its reaction, which sometimes shows an excessive acidity, and at other times is alkaline at the moment of emission, and contains in the latter case an undue amount of phosphates;—or in its contents, which may be abnormal, and exhibit albumen, sugar, cystine, or the salts of oxalic acid.

Disturbances in the generative organs, evidenced by perversions of the menstrual function, or by leucorrhœa in the female; or by impotence, priapism, or spermatorrhœa, in the male.

Alterations in the skin, manifested sometimes by febrile heat and suppression of perspiration, in other cases by general coldness and chilliness, especially of the extremities, with perspiration on very

slight exertion; or by alterations in its colour or texture, which may be earthy or sallow in tint, or dry and coarse; or by various eruptions, among the most frequent of which are erythema, eczema, herpes, acne, impetigo, lichen, and urticaria.

Alterations in the circulation, evidenced by frequent palpitation, occurring either spontaneously or on very slight exertion: by irregular action and intermission in the rhythm of the heart's contractions; and by weakness or excitability of pulse.

Alterations in the respiration, as shown by dyspnoea occurring spontaneously, with a sense of load at the chest, or on slight exertion; or by cough, usually dry; or by asthmatic paroxysms.

Alterations in the general nutrition, as shown by anæmia; by emaciation, affecting all the tissues, but especially seen in certain parts, as in grayness or loss of the hair, caries of the teeth, retraction of the gums, and incurvation of the nails, which are thin and friable; or by excessive liability to inflammation, from slight causes, of the mucous membranes, and particularly of the conjunctivæ and throat. To which we may add, in persons predisposed to such affections, a liability to gout or rheumatism; or to renal or pulmonary affections; so that, by very common consent, pulmonary phthisis has been frequently regarded as a consequence of long-continued derangement of the digestion.¹

These symptoms are very variously grouped, and sometimes occur with great irregularity, and it is important to note that those affecting the stomach may in some cases be far less prominent than others which, though occurring in distant parts, are still valuable evidence of the primary disturbance which exists in the function of digestion.

It must further be remarked, that many of them are not referable to the disorder of the stomach alone, but to perversions of the functions of the lower portion of the intestinal canal.

The secondary disturbances in the nervous system belong in an almost equal degree to derangements of the stomach and of the intestines; for, as Beaumont has shown that vertigo was a common effect of irritation of the former, so, on the other hand, clinical experience is constantly demonstrating that this symptom is also produced from flatulence and other derangements of the functions or condition of the latter. Many also of the moral and emotional

¹ See especially Wilson Philip and Dr. Hughes Bennett. This subject will be more fully dwelt upon hereafter.

disorders, and particularly depression of spirits, irritability of temper, and hypochondriasis, though by no means invariably caused by disturbances of the digestion, and frequently depending on primary disorders of the nervous centres, appear often to result directly from the constipation so frequently present; and though the origin of this is threefold—resulting from imperfect changes in the food, diminished peristalsis of the muscular coats of the bowels, and from deficiency of secretion from the mucous membrane, the liver, and the pancreas—it is probably in a great measure to the last-named cause, which must materially affect the composition of the blood, that the nervous phenomena of this class are mainly attributable.¹

In considering the causes of dyspepsia, we must remember that it is not a disease *per se*, but is the sign of any derangement occurring in the relationship between the stomach or intestines and the food presented to them. It must also be borne in mind that this relationship is twofold, and depends not only on a healthy state of these viscera, but also on a proper adaptation of the ingesta both in quantity and kind to the wants of the system, and to the properties and powers of the digestive organs, and that any aberration in either direction may serve as the starting-point of these derangements. The causes of dyspepsia may therefore be conveniently divided into those which directly depend on unsuitability of the food, and those which affect the physiological functions of the chylopoietic viscera, and particularly of the stomach.

I. DYSPEPSIA FROM UNSUITABILITY OF FOOD (*Dyspepsia ab ingestis*) stands, at least in degree of frequency, in an almost equal rank with that arising from disturbances primarily originating in the stomach, and may depend upon errors in diet, referable either to the quality or to the quantity of the food taken.

1. As regards quality—

(a) Aberrations may occur in regard to the proper proportions of the different kinds of nutritive matter which the food may contain; for since the human digestive apparatus is adapted for the elaboration of a mixed diet of animal and vegetable substances, any undue preponderance of either may, as has been shown by long experience, prove injurious not only to the system at large,

¹ This subject has been fully treated of by Dr. Chambers (Lectures chiefly Clinical).

but also to the stomach. If the diet consists too exclusively of protein substances, the amount necessary to be supplied in order to repair the waste of the hydrocarbons in respiration and in other requirements of the system is greater than the stomach alone is capable of digesting, except at long intervals or under peculiar conditions of muscular exertion. On the other hand, an excess of saccharine or amylaceous materials, while stimulating the secretion of the gastric juice, will by their mere presence in the stomach give rise to an excessive secretion of a free acid,¹ with which they are incapable of combining during the act of digestion, and which therefore will pass with them into the intestinal canal, deranging the functions both of the bile and pancreatic fluid. Moreover, an excess of starchy substances seems positively incapable of being digested; and when thus taken, a large quantity passes unchanged by the feces,² while other portions undergo fermentative changes, and give rise to flatulence, to which persons living on an exclusively vegetable diet are peculiarly liable. Bidder and Schmidt³ have also shown that an excess of fat taken with the food hinders the secretion of the liver. The effects therefore of a diet in which this preponderates are, under ordinary circumstances, injurious in a twofold direction, through preventing the formation of the bile, which has so important an influence in aiding the secondary digestion and absorption of these substances from the intestines.

(a) Though all food, both animal and vegetable, contains a certain amount of indigestible matter, which ultimately passes out of the body by the feces, and in moderate proportions is probably beneficial in stimulating the peristaltic actions of the intestinal canal; and the necessity for which is shown by the habit of those nations which live chiefly on fatty substances, of mingling them with some solid indigestible ingredients, as sawdust or clay;⁴ yet an excess of these, especially as they occur with greatest abundance in vegetable food, is very liable to irritate the stomach, and is a frequent cause of indigestion in the poorer classes.

(γ) The digestibility of various aliments is largely influenced by the manner of preparation. With regard to animal substances the positive necessity for previous *cooking* is not so evident as in

¹ Bernard finds that exciting the secretion of gastric juice in dogs, without food, exhausts the animal. (Lec. Phys. Exp. ii. 420.)

² Parkes, Pract. Hygiene, p. 153.

³ Loc. cit. pp. 146-149, 236.

⁴ Paris, Treat. on Diet and Reg., p. 131.

those derived from the vegetable kingdom. If heat be applied too rapidly to the former, the firmness of the coagulation thus produced in the albuminous constituents is positively prejudicial to the digestive process; while, on the other hand, the process of slowly stewing meat, which softens the fibres and diminishes their cohesion, is a great aid to the action of the gastric juice.¹ It is only necessary in support of this proposition to allude to the influence of cookery upon eggs, which affords a threefold illustration of these principles. It is now generally believed that uncooked albumen² is less digestible than that which is slightly coagulated, while the indigestibility of a hard-boiled egg is too well known to require more than a passing allusion. It is, however, on vegetable substances that the influence of cookery is most apparent. The effect of boiling or other moist heat is to cause the starch grains to swell and burst the walls of indigestible cellulose in which they are confined, thus bringing them more easily under the influence of the saliva, which is exerted with greater rapidity and facility in the swollen and softened condition than in their natural state.

(d) Next in order in this category may be mentioned alimentary substances which have undergone changes rendering them unfit for food, either from their irritant action on the alimentary canal or through their liability to further putrefactive or fermentative changes, or to arrest or pervert the normal process of digestion in the stomach. Among these may be mentioned diseased meat, decomposed sausages, poisonous fish, ergoted bread (which has been known to cause gangrenous spots in the stomach³), fungi in bread,⁴ and substances introduced in a state of fermentation, as sour bread, sour milk, and imperfectly fermented beer or wine. The use of impure water⁵—especially of such as contains sulphate or carbonate

¹ Bernard found that cooked meat is more rapidly digested than raw, and that intestinal digestion is greatly assisted by this process. (Leo. Phys. Exp. Appliquée, ii. 402, 444.) See also Weber and Budge, *Nonnulla de Digestibilitate Carnis* (Gryphis, 1858). Mulder also has shown that fibrin and albumen become by cooking more highly oxidized and more soluble in water. (Moleschott's *Diätetik*, p. 450, quoted by Chambers, "Indigestions.")

² Kühne, *Lehrbuch der Phys. Chemie*, i. 46; Meissner, *Zeitsch. Rat. Med.* 3d Ser. viii. 292; Arnold, *Ueber die Verdauung des Thierischen Eiweisses*. Canstatt's *Jahresab.* 1858, i. 38.

³ Reynaud, *De la Gangrène*, p. 146.

⁴ Cause epidemic diarrhoea. (Parkes, *Pract. Hygiene*, p. 193.)

⁵ See Parkes, on *Pract. Hygiene*, pp. 47, 48, for much information on this subject. "It is a well-known fact that grooms object to giving hard water to horses, on the ground that it makes their coat staring and rough—a result which has been attributed to some derangement of digestion." Water containing more than eight grains of each substance in the gallon, "individually or collectively" ap-

of lime, or chloride of calcium, or magnesian salts in excess, and even in some instances of ferruginous water—has been observed to prove a cause of dyspepsia, which appears from the symptoms described to have approached the irritative type. The effects of other impurities, as animal and vegetable matter, or the salts of lead, are well known, but appear rather to be exerted on the intestinal canal than on the stomach—which, however, probably in many cases sympathizes in the derangement thus produced.

Alcohol, in addition to other injurious effects, may, when taken in excess, arrest the action of pepsine, though in ordinary states of dilution it appears incapable of exerting this influence. In the same class must be placed diluents in too great quantity, or ice, or large draughts of cold water taken during meals, which hinder digestion both by lowering the temperature of the stomach and by diluting excessively the gastric juice.¹

(c) Next in order, we must remember that imperfect mastication tends remarkably to retard the digestive act,² and that both the protein and starchy elements of food are thus affected. The former are imperfectly digested, because introduced into the stomach in a form in which they are only slowly and with difficulty subjected to the action of the gastric juice;³ and the latter, from the want of the direct effect produced by the saliva, tend to undergo fermentative changes. Hence, as will be seen hereafter, insufficient mastication is a very common cause of irritative dyspepsia, and also of acidity and flatulence. In addition to the frequency with which this form of indigestion is met with in those who eat hastily, it must be mentioned that it tends specially to occur at two different epochs of life—firstly, at the period of the second dentition,

appears to be injurious to many persons. Confirmatory evidence will be found in Todd, "Indigestion," *Cyc. Pract. Med.*, iii. 627; also in Brinton, *Dis. of Stomach*, p. 311.

¹ This only applies to an excess of these fluids. There are some causes of atonic dyspepsia when the enfeebled solvent power of the gastric juice will not bear dilution, and when digestion is promoted by abstinence from fluids during meals; but, in the majority of instances, the habit of drinking whilst taking food is only injurious when the use of fluids is substituted as a diluent for the saliva and buccal secretions, and the food is thus washed down after imperfect mastication and insalivation. Bidder and Schmidt have shown that a certain supply of water favours the secretion of the gastric juice. If fluids are injurious when taken with meals, they should be drunk an hour or two after, since numerous authors (Schwann, *Müller's Archiv*, 1836; Meissner, *loc. cit.*; Kühne, *loc. cit.* p. 39) have shown that the absorption of the peptones already formed, and which hinder digestion, is favoured by further dilution.

² The influence of mastication in promoting digestion was noticed by Spallanzani, *Exp. sur la Digestion*, 1783, p. 243.

³ The saliva appears to have little or no effect on these substances.

when, after children have become accustomed to a mixed diet, perfect mastication is prevented (unless great care be exercised), by the partial loss of the first teeth before they are replaced by the permanent set; and secondly, in old age, when a similar cause comes into operation.

Imperfect changes in the amylaceous substances may also result from diseased states of the salivary glands and of the saliva. It may be sufficient briefly to mention here those cases where, through fistula or otherwise, the supply of saliva is necessarily deficient in quantity; but there are other morbid conditions in which the saliva presents aberrations in quality, which, though the nature of their operation has not been fully elucidated, must, it is believed, exercise an injurious influence on the digestion of the starchy matters of the food. Thus, in some paralytic and irritative conditions of these glands when large quantities are expectorated, as occasionally occurs in the salivation attending pregnancy, and also in the excessive secretion under abnormal stimuli which takes place from the abuse of the habits of smoking and chewing, there is reason to believe, from the similarity of these states to those where excessive secretion has been artificially produced, that its quality may be materially changed.¹

Changes in the chemical reaction of the saliva must also exercise an important influence on the metamorphosis of starchy matters. The buccal mucus occasionally tends to acquire an acid reaction, and in such circumstances it causes starch rapidly to undergo a series of changes ending in lactic acid. This tendency, which is ordinarily counteracted by the alkaline saliva of the mouth, is, however, liable to ensue when the saliva is acid—a state which has been observed under many different circumstances.² It is moreover not improbable that other perversions of the salivary secretion may occur, affecting its action on starch, with which we are as yet unacquainted, but of which some indication may be

¹ See Kühne, *Lehrbuch der Phys. Chem.*, Lief. 1. pp. 5, 23.

² See Wright, *Lancet*, 1842-43. Lehmann, *Handb. der Phys. Chemie*, p. 252; and Kühne, *loc. cit.* pp. 11, 24. See also Frerichs, art. "Verdauung," *loc. cit.* 761. M. Chomel (*Des Dyspepsies*) treats of this acid condition of the saliva as a distinct form of dyspepsia. The propriety of such a classification may, however, be doubted after the observations of Frerichs, who has shown the frequency of the affection, not only as a concomitant of many and various disorders of the stomach (inflammatory and cancerous), but also of many other local and constitutional diseases (diabetes, encephalitis and pleuritis, acute rheumatism, uterine affections, and arthritis).

afforded by the observation that the saliva in some cases of dyspepsia has been found deficient in sulphocyanide of potassium¹

Further, though foreign to this branch of the subject, it may be noted that the alkaline saliva is one of the most powerful stimuli for the secretion of the gastric juice, and that a deficiency in its quantity, or perversions of the quality of its reaction, are probably not without considerable influence on the proper secretion of the latter of these fluids.

(5) Even when not defective in quality, food may be wanting in substances capable of stimulating the secretion of the saliva and gastric juice. Savoury substances, and especially common salt, have generally had this function attributed to them; and even of the other condiments it must be recollected that habit may render the use of a certain amount necessary, when they have been long and habitually taken with food.

Climate and other conditions, possibly of race, but more probably connected with the diets of different countries, largely influence the conditions under which a greater or less amount of these substances is hurtful or beneficial. They can be more freely taken by the old than by the young, and in the former they often appear to aid digestion. The use of hot curries and peppers by Europeans in Eastern countries would seem to arise from an attempt to stimulate the appetite and the secretions of the mouth and stomach, which share in the exhaustion produced in the system by the heat of the climate. Possibly also a stronger stimulus may be required to determine a sufficient supply of blood to the stomach for the purposes of digestion, when from the high external temperature the circulation of the skin is unusually active; and a large amount is certainly taken under such circumstances with an impunity which would hardly be enjoyed if these substances were indulged in by an ordinary inhabitant of a more temperate climate. To the natives, indeed, the addition of condiments to a diet almost exclusively consisting of rice probably aids its digestion, and prevents flatulence by promoting the flow of saliva. Beaumont and other subsequent authors have, however, shown that, except when taken in great moderation, these substances have ordinarily very little power of aiding stomachal digestion,² by which the assimilation

¹ Hamberger, loc. cit. p. 283.

² See the observations on the effects of stimulants under the head of Acidity, p. 21.

of protein matters is mainly effected. The subject in this respect appears still somewhat obscure, but there can be very little doubt that an excess under ordinary circumstances may act injuriously by causing irritation of the stomach, and thus positively lessening the secretion of the gastric juice; and, even when their habitual use has diminished the tendency to this effect, they render the mucous membrane less capable of responding to the stimulus of ordinary food.

(7) Lastly must be mentioned in this category those peculiar idiosyncrasies which are occasionally exhibited by persons whose digestion is otherwise good, but on whom many of the severer symptoms of dyspepsia may be excited by the use of certain, even of the ordinary, articles of diet: of these, shell-fish afford perhaps the most common examples, but in others there appears a similar incapability of digesting milk or eggs, cooked butter,¹ or even mutton.² The converse, however, is sometimes the case, and in some diseased conditions articles of diet which are ordinarily ranked as indigestible appear to excite less disturbance than those which *à priori* might be deemed of a more suitable character.

2. It might appear almost unnecessary to dwell at any length on the influence of an excess of food beyond the powers of the stomach in causing dyspepsia. Such a perverted relationship involves the essential condition of failure; and yet it is unfortunately the one which of all others may be said to be the most common, and that not only when the stomach is weakened by disease, and the patient is incapable of accurately estimating his digestive powers, but under circumstances when, in an otherwise healthy subject, the appetite is artificially stimulated by the refinements of cookery. Such abuses have been so constant a theme of moralists and physicians that further comment would appear unnecessary, were it not that in minor degrees, which would be insufficient to convict of gluttony, the habit is continued, in all classes whose means enable them to procure sufficient food, to an extent which impairs the comfort of many a sufferer from what is supposed to be a weak digestion, but which is only weak relatively to the wishes, rather than to the real wants of the patient. The secretion of the gastric juice, at least in a healthy state, seems in some yet unexplained manner to be proportioned to the amount of material

¹ Chomel, *Des Dyspepsies*, p. 8.

² Sir T. Watson, *Princ. and Pract. of Physic*, ii. 457.

required for the repair of the waste of the system, and in the majority of cases of food introduced in excess of this acts as a foreign body, and undergoes fermentative or putrefying chemical changes; or in comparatively few instances where these do not ensue, and the food is digested and assimilated, it gives rise to obesity and other evils, on which it would be beyond our province to dwell.¹

Irregularity, and especially too small intervals between the periods of meals, involving the taking of food before the preceding supply has been digested and removed from the stomach, is another most frequent, and, when indulged, a necessary source of indigestion. It is well known that the digestive powers of a given amount of the gastric secretion are limited, though the absorption of the peptones already formed, while the pepsine is retained in the stomach by the dialytic action of the mucous membrane,² greatly extends the duration of its action. It is nevertheless evident that if as much food has been taken at one meal as the stomach can digest, the addition of a fresh supply before the former has passed from its cavity will only delay the changes which the whole has under such circumstances to undergo. Some food has been shown by Busch's observations to pass rapidly into the duodenum; but a period of nearly five hours³ must elapse before the whole of a full meal has passed through the pylorus, and in addition to this it is most important that a period of rest varying from one to two hours should be allowed to the organ. There are few medical men who are not acquainted with patients who allow a much shorter interval than this between each of the three principal meals of the day, and the effects of such a system of eating are as injurious as, and practically are identical with, those of excessive eating; though it is often difficult to convince those who indulge in it of the error in their habits.⁴ Many delicate people think that it is necessary to eat often to keep up their strength, but fail to recollect that when such a procedure is necessary, each meal taken should be small in quantity, and that when meat is eaten three times daily in tolerable quantities, the addition of milk, eggs, wine, and beef-tea in the intervals, destroys the beneficial effects of all. It must be borne in mind also, in estimating the effects of a given diet on

¹ See Dr. Parkes' excellent summary of these conditions in his treatise on *Pract. Hygiene*.

² See Kühne, loc. cit. 39.

³ Weber and Budge, loc. cit., Kühne, loc. cit.

⁴ See a case in point by Sir T. Watson, *Principles and Practice of Medicine*, il. 450.

the health of a patient, that the amount required varies with the expenditure of the system, and that a sedentary life, whether habitual or suddenly entered upon, necessitates a reduction of the food taken, if health is to be maintained. The breach of this rule is often observed, and the ill effects produced on those who, having previously lived an active life, retain their customary habits of eating in periods of enforced or voluntary idleness, has long been well known. Indeed, in all dyspeptic derangements, it is important for the practitioner to be on his guard against possible errors in diet, and especially against those which, having become a question of habit, and of relative rather than of absolute excess of the food taken, are the more likely to elude both his own and his patient's observation.

Deficiency of food, though often mentioned among the causes of dyspepsia, and unfortunately holding among these but too prominent a place in the poorer classes of society, acts probably only in an indirect manner on the digestive powers by weakening those of the whole system. In these cases the food is also too frequently of innutritious quality, and the sloppy tea and bread, which forms so large a proportion of the diet of many of our hospital patients, is a constant source of the flatulent disturbances from which they suffer, and which, under the circumstances in which they are placed, are often very difficult to relieve. The effects of starvation, and the dangers of indiscriminately giving nourishment in these cases, are familiar to all readers of physiological works, and will be referred to under the head of Atonic Dyspepsia.

II. CAUSES OF INDIGESTION WHICH ARE IMMEDIATELY REFERABLE TO THE STATE OF THE STOMACH, are those which affect either the secretions by which the chemical changes in the food are effected, or the movements by which these changes are assisted, and by which also the partially digested food is conveyed into the duodenum; or the absorption of such materials as when present in excess may hinder the digestive process. It must, however, be remembered, that the causes of indigestion of this class are not exclusively confined to the stomach, but that the disorder may depend on aberrations in the buccal or salivary secretions, or in those of the liver, pancreas, and intestines; and that, according to the nature of these, the digestion of amylaceous saccharine, or protein matters, may be injuriously affected.

Our information regarding the manner in which the last-named

of these factors is affected by any of the pathological conditions with which we are acquainted, is as yet very imperfect. We know that the digestive process is aided by the absorption of peptones;¹ and from the fact that grape sugar is also largely absorbed from the stomach, it is probable that if, through unhealthy conditions of the mucous membrane, the blood, or the lymphatics, any hindrances to absorption should occur, their unfavourable influence in this respect would be far from immaterial, and in the case of glucose they are probably, though seldom acting singly, the cause of the excessive acidity sometimes observed.

The other agencies in the process may be either abnormally increased or diminished, or perverted; and as with all such changes dyspeptic derangements are known to occur, it might be possible to use this mode of division as a means of distinguishing varieties of the disorder. Such a classification appears, however, less logically applicable than that which it is proposed to adopt, since these alterations will be found to be present in a great variety of diseases of the stomach, and to be common elements both to those in which anatomical alterations are known to be present, and in others where no such changes have as yet been discovered. We shall therefore limit ourselves here to a brief exposition of the causes of these derangements of function, reserving the fuller description of their mode of operation, and also of their effects, for the sections devoted to the special descriptions of the symptoms, and to the discussion of the pathology of these disorders.

The following scheme embraces the conditions by which the functions of the stomach may be deranged. It will be noticed, that in many the disorder thus produced does not depend primarily on an affection of the viscus, but is frequently the result of agencies operating through parts of the system which have no immediate relation to the digestive process. The causes of dyspepsia are thus in many cases of a hygienic character,² depending on the habits of life of the sufferer from this complaint, or on constitutional conditions resulting from these, and to which our attention must be mainly directed in any attempts for their relief and cure.

¹ See *ante*.

² See some excellent remarks on this subject in a pamphlet by M. Durand Fardel, "*De la Dyspepsie*," 1854.

CONDITIONS OF THE STOMACH AFFECTING EITHER SECRETION OR MOVEMENT

I. ORGANIC ALTERATIONS REFERABLE TO ANATOMICAL CHANGES.¹

- | | | | | |
|-------------------------------------|---|----------------------------|---|-----------------------------------|
| A. Local. | { | Congestive. | { | Thickenings. |
| | | Inflammatory. | | Morbid growths. |
| | | Degenerative and Atrophic. | | Cicatrices. |
| | | Ulcers. | | |
| | | New formations. | | Alterations in shape or position. |
| B. Due to general states of system. | | | { | Pyrexial. |
| | | | | Preguancy(?). |

II. FUNCTIONAL DERANGEMENTS NOT ASSOCIATED WITH ANATOMICAL CHANGES.

- A. General. { Constitutional states of system, involving impaired vital power, or altered qualities of the blood.
- B. Neuroses. { Hysterical. Hypochondriacal. Moral. Emotional. Intellectual. Fatigue. Shock. Sympathy with diseases of other parts.
- C. Idiosyncrasies.

With regard to this arrangement, it must be observed that, in many of the diseases thus enumerated, both the movements as well as the secretions (and also probably the absorptive powers) of the stomach are simultaneously affected. The relative degree in which each of these functions suffers varies, however, in different affections, and therefore for a full comprehension of these effects it will be proper to pass briefly in review the causes of their derangements as they affect each singly.

I. Derangements of the movements of the stomach as a cause of indigestion.

The aids afforded to the digestion by the movements of the stomach are of a twofold nature, acting, first, by maintaining the regular and rhythmical movement of the food in its interior by which the alimentary matter is brought completely in contact with the gastric secretions; and, secondly, by expelling it into the intestines after it has undergone the proper degree of elaboration. These actions may be prevented by causes which may either (1) produce deficiency of such movements, or (2) may pervert their harmony and rhythmical order, or (3) may abnormally increase the resistance at the pylorus to the exit of the food; or which, on the other hand, may (4) by exciting too great a peristaltic action, cause the food to pass with undue rapidity into the intestinal portion of the canal.

¹ This includes such changes as are discoverable by microscopic research.

Effects of the first-named class may be produced by atrophy and dilatation of the organ through paralytic conditions, induced either by impaired innervation or by alteration of the nutrition of its muscular fibres. Similar changes, which are in all probability referable to the same immediate causes, result from severe or long-continued inflammatory affections of the peritoneal, and to a less degree of the mucous membrane; for though the evidences of the latter are usually shown by vomiting, the final result is to cause a suspension or destruction of the contractile powers of the muscular coat.¹

It is probable also that similar conditions of defective muscular power may occur in cases where no organic alteration can be discovered,² but which are characterized by impaired states of the general nutrition, to which more special allusion will be made hereafter.

Irregularities of contraction are produced by adhesions to neighbouring organs; by the dragging of omental hernias upon the stomach; by morbid thickenings and growths in its walls; by deep ulcerations extending into its muscular coats, accompanied with thickening of the surrounding tissue; and by cicatricial contractions resulting from the cure of such ulcerations. Similar effects are produced by the displacements of the stomach occasioned by tight lacing;³ or by simple pressure on the organ when distended with food, such as is caused by a stooping position after meals, as in writing, or in many trades, especially in those where the needle is used, or in that of the shoemaker. The pressure also of other organs, or of tumours originating externally to the stomach, upon the pyloric region, or ulcerations, contractions, tumours, or the impaction of foreign bodies occurring at this outlet, will, unless compensated for by an adequate increase in the muscular coats, act as obstructions to the due propulsion of the food.

Excessive contraction of the coats may, on the other hand, hurry the food too quickly from the stomach; and though it has been shown by Bernard,⁴ Busch,⁵ and Kühne,⁶ that some food does within a very short period after its ingestion pass comparatively unaltered into the intestines, yet normally by far the greater portion is di-

¹ Analogous to the fatty degeneration of the heart often seen in pericarditis.

² Chomel, loc. cit. p. 48, describes among the causes of dyspepsia, relaxation of the abdominal muscles occurring after pregnancy.

³ Chomel, *Dyspepsies*, p. 25, Beau, *Gaz. des Hôp.* 1859, p. 390; Dr. King Chambers, loc. cit. p. 88.

⁴ *Phys. Exp.* ii. 423, 421.

⁵ Virchow, *Archiv*, vol. xiv. p. 140.

⁶ Loc. cit. p. 83.

gested in the stomach, and the effect of its too speedy exit before it has undergone proper elaboration will be to embarrass the functions of the bile and pancreatic fluid. Such undue rapidity of passage may in some instances be produced by reflex contractions excited through minor degrees of inflammatory action of the mucous membrane, which are insufficient to produce the secondary paralytic effects before alluded to. In other cases increased muscular action is due to an abnormally excitable condition of the nerves supplying the viscus, and is sometimes influenced by emotional causes which under such circumstances tend to give rise to an increased peristalsis of the whole canal.

Hypertrophy of the muscular coat may be believed to have a similar effect, though this is seldom an uncomplicated disorder; and our observations with regard to it are, therefore, wanting in exactness.

Under this head must also be mentioned the effects of destruction, by disease, of the pyloric muscular ring, which, when not complicated by the simultaneous obstruction of this orifice by morbid growths, results in permitting food to pass unresisted by its normal contraction during the earlier periods of digestion.

Other perverted actions of the muscles produce either pain or vomiting, which, however, are rather results than causes of dyspepsia, and which have been already considered.

II. *Secretions.*—In considering the alterations in the secretions of the stomach which may be the immediate causes of indigestion, it must be remembered that these are of two kinds, and are elaborated by glands having different anatomical characters. The true acid gastric juice, which, as a rule, is only secreted under conditions of physiological stimulation, is furnished by those situated in the fundus and body of the organ, which are lined by a spheroidal epithelium; while that afforded by the glands of the pyloric region, which in the human subject occupy only a relatively small tract of tissue, and whose epithelium is columnar, is alkaline, and presents all the characters of ordinary mucus. It is, moreover, known that the amount of either of these secretions may preponderate considerably over the normal proportions; and that a deficient supply of the peptic fluid is often associated with the formation of an excessive amount of mucus which possesses little or no digestive powers, and which may give rise to fermentative changes in the food.

Diminution in the amount of the gastric juice secreted will, in relation to the ingesta, stand in a parallel condition to the effects produced by excess of the latter in proportion to the digestive fluid. An excessive secretion, on the other hand, will not only exhaust the powers of the patient, and possibly disturb the action of the liver, the pancreas, and the kidneys; but also, owing to the imperfect neutralization of the fluid thus poured out by the food presented to it, may, by imparting to the latter an unduly acid reaction, retard the normal conditions of digestion in the intestines. Finally, alterations of quality involving either a deficiency of pepsine or an excess of acid¹ will produce effects, according to the degree in which either preponderates, corresponding to those which have just been mentioned.

Of the effects produced on the digestive properties of the gastric juice by its admixture with urea² and sugar, which occur respectively in albuminuria and diabetes, we have no very accurate knowledge; in the former of these diseases, dyspeptic phenomena and vomiting are often present, but organic changes in the stomach frequently coexist, which will require to be more fully dwelt upon hereafter.

Of the conditions capable of producing indigestion from abnormal conditions of the stomach, those which affect the secretion of gastric juice may be enumerated under the following heads:—

I. CAUSES TENDING TO PRODUCE DEFICIENCY.

- | | | |
|---------------|---|--|
| A. Organic. | { | (1) Inflammatory conditions, which reduce the amount of peptic fluids but increase the mucus secreted. |
| | { | (2) Congestion. |
| | { | (3) Degeneration and atrophy of the secretory glands. |
| | { | (4) Pyrexial conditions of the system. |
| B. Inorganic. | { | (1) General weakness. |
| | { | (2) Disordered blood-states. |
| | { | (3) Disorders of liver and pancreas (?). |
| | { | (4) Agencies operating through the nervous system—moral, intellectual, shock, exhaustion, invasion of acute diseases, narcotic remedies. |

II. CAUSES TENDING TO PRODUCE EXCESSIVE OR PERVERTED SECRETION.

- (1) Ulcer and cancer.
- (2) Inorganic agencies operating through the nervous system, chiefly sympathetic, and depending on irritation of other organs, as the mouth, fauces, intestinal canal, liver, gall-bladder, kidneys, and uterus.
- (3) Disordered blood-states.

¹ See Acidity, note 1, p. 23.

² See ante.

The consideration of the manner in which the secretions of the stomach are affected by its organic diseases can only be briefly alluded to here. In relation to these, however, Bamberger's¹ remark is well worthy of attention, that except in cases where ulcerations or the growth of tumours have severely implicated important nerve trunks, a slighter disease affecting a large surface produces more evident derangement of the digestive functions than a more severe affection occupying only a limited area of the organ—a proposition which is especially true of the minor degrees of the inflammatory or catarrhal affections.

Our knowledge of the effects on the gastric juice, produced by alterations in the composition of the blood, is very imperfect. Nor have we attained to any greater precision in respect of those resulting from alterations in the liver, spleen, and pancreas, except through the intermediate agency of the secondary congestions which derangements of the circulation in the two former may cause in the mucous membrane of the stomach. The theories of Prout,² Schiff,³ and Corvisart,⁴ that the acid secretion from the stomach, and the alkaline secretions of the liver and pancreas, are possibly compensatory for, and "antipolar" to, each other, may hereafter throw more light on this subject; but at present our knowledge points rather to the secondary affections of the latter secretions through imperfections in that of the stomach, than to any influence exercised in the converse direction.

The precise manner, also, in which the secretions of the stomach are affected through the agency of the nervous system, still requires further observation. The principal results of the various experiments which have tended to elucidate this problem, have already been quoted under the head of Acidity. In addition to the remarks there made, it appears only necessary to allude further to the influence of shocks to the nervous system,⁵ or of emotional influences—such as fear, anxiety, grief, and similar agencies—the effects of which on the digestive process have been long known and described. The analogy, also, which exists between these derangements and the results of emotion as seen in external parts—coupled with the similarity of the latter to the phenomena induced by paralysis of

¹ Loc. cit. p. 140.

² Stomach and Urinary Diseases, p. 24. ³ Wagner's Archiv für Heilk. 1861.

⁴ Collection de Mém. sur le Pancréas, p. 189 et seq.

⁵ Such as bathing after meals, practised by the Romans to procure vomiting; quoted by Chomel, loc. cit. p. 24.

the sympathetic or spinal nerves—renders the explanation of these functional disturbances, if not complete in all its details, a subject in which some degree of certainty may be at least approximately maintained.

To the same agency also are to be attributed the action of other cerebral influences, and especially of severe mental effort, the effects of which on the digestive process are much more injurious than those produced by mere muscular exertion; although the latter, when carried to excess, or if indulged in too soon after a meal, has very similar effects in arresting or retarding the digestion. Organic cerebral diseases are also not unfrequently associated with dyspeptic symptoms, which for a time may be sufficiently severe to draw away the attention of the observer from the more important malady.

It is to similar causes affecting the stomach, by reflex agency, that a large number of the disturbances in the digestion arising from affections in distant parts are probably attributable. Some of the most important of these are, as pointed out by Trousseau,¹ affections of the lower portions of the gastro-intestinal canal. Thus constipation is a frequent cause of dyspepsia; and a sudden impression made on the nerves of the rectum, as by an enema taken when the stomach is full, may immediately arrest the digestive process;² and with them may be enumerated the dyspepsia arising from worms in the intestines, which has been erected by some writers into a separate species.³ In addition to these, many of the conditions enumerated as causes of vomiting appear, *à fortiori*, capable of affecting the process of digestion.

It will be seen from the foregoing that indigestion is, in probably a considerable majority of cases, the result of pathological conditions of the stomach, which vary widely from one another in their essential nature and in their etiological relations. It is therefore impossible to form logical categories of classification founded on the derangements so produced in the functions of the stomach, since all of these—vomiting, pain, flatulence, acidity, etc.—may each in turn depend on many and totally different causes, some of which are organic and some purely functional in their nature. Nor can any convenient classification according to the causes of indigestion be adopted, since even in those forms which arise from imperfections

¹ Union Médicale, 1857.

² Dyspepsie Vermineuse—Beau.

³ Trousseau, *loc. cit.*

in the manner in which the food is presented, the result is frequently a complex one, and secondary effects of an inflammatory nature are often thus produced in the mucous membrane of the stomach which surpass in importance of intensity and duration the primary disorder of function. Much of the difficulty and uncertainty in the treatment of indigestion appears to the author to have arisen from the nosological classification adopted by many writers, who consider indigestion as an individual disease. Thus, by Cullen,¹ it was regarded as the result of atony; by Broussais,² as the almost invariable effect of inflammation; and by Barras,³ as chiefly produced by disturbed innervation. The confusion has been further increased, especially by some recent writers of the French school, by its subdivision into varieties, according to the prominence of single symptoms, in the manner now alluded to. There are atonic inflammatory and neurotic disturbances of digestion, as well as those resulting from more severe organic diseases; but there appears to be the gravest reason to doubt whether an "idiopathic" or "essential" dyspepsia, as it is termed by some of these authors⁴ has any real existence, independently of causes existing in either the food or in the state of the stomach. A classification therefore on a pathological, and as far as possible on an anatomical, basis, is the only one which can conduce to certainty of diagnosis, or to scientific principles of treatment.⁵

The main lines of division which will be here adopted will be to distinguish the non-inflammatory dyspepsias from those which depend on inflammatory changes; the disorders produced by ulcer and cancer standing again in a distinct and separate category. In the first-named class will be included dyspepsias from simple weakness, whether general or local, and with these will be classed those forms resulting from atrophy, or from simple degeneration of the

¹ Nosology.

² Histoire des Phlegmasies, Lec. Phlegm. Gastriques.

³ Traité des Gastralgies et Enteralgies; also Johnson on Morbid Sensibility of the Stomach and Bowels.

⁴ Trousseau, Traité de Thérap. ii. 477: "Dyspepsie essentielle, c'est à dire ayant en elle la raison suffisante de son existence." M. Chomel, Traité des Dyspepsies, 1857, divides *idiopathic* dyspepsia into the following: Flatulent, gastralgic, enteralgic, boulimic, acid, alkaline, and the dyspepsia of liquids. M. Guipou, Traité de Dyspepsie, ouv. couronné par l'Acad. Imp. de Méd. 1864, adopts a similar division, but adds another form, the "hyperurémique" or "pituiteuse;" this latter appears to be a form of chronic catarrh.

⁵ This classification was first clearly laid down by the late Sir James Clark, who distinguished the inflammatory, nervous, and atonic forms: "Climate," 1830. See also Dr. J. Todd, art. Indigestion, Cyc. Pract. Med., vol. iii. Dr. Todd's varieties of "follicular" and "scrofulous" indigestion appear to me to fall more naturally into the inflammatory classes.

secretory glands, to all of which, collectively, the term of atonic dyspepsia will be applied.

Disorders in the functions of the stomach distinctly referable to impaired innervation will form a separate category, and the inflammatory varieties will be considered under the heads of the acute and chronic forms.

PART II.

SPECIAL DISEASES.

I.

ATONIC DYSPEPSIA.

ATONIC DYSPEPSIA, which corresponds to the *Dyspepsie apyretique* or *asthénique* of Broussais, may be defined as a disorder of the digestion, almost invariably chronic¹ in its course, unattended by fever, and rarely, when uncomplicated, by abdominal pain; whose existence is indicated by weight, uneasiness, and languor following the ingestion of food, together with a general depression of the vital powers; and whose causes are, in a great measure, identical with those which induce a general impairment of the nutrition and the powers of the whole body.

ETIOLOGY.—Among the predisposing causes of atonic dyspepsia may be mentioned *hereditary disposition*, the evidence of which, though not resting on absolute numerical data, is so well attested by numerous observers, and, the author may mention, by many instances within his own knowledge, as to be, he believes, incontestable.

Age also exercises an important influence in determining this disorder, the diminution of the power of the stomach at advanced

¹ Some writers, and especially the late Dr. J. Told, *Cyc. Pract. Med.* iii. art. Indigestion, describe an acute form of atonic indigestion, in which there is a sudden and total arrest of the digestion, attended with symptoms of irritation of the stomach. It may, indeed, be induced by sudden impressions made on the nervous system during the act of digestion; but unless under these circumstances the contents of the stomach are at once evacuated by vomiting, they prove a further source of irritation, and give rise to a condition of more or less inflammatory action, corresponding closely in character to the "Embarras Gastrique" of the French, and which will be more properly treated of among the "Inflammatory States of the Stomach."

periods of life being, in many instances, as apparent as is that of the muscular or nervous system—a fact which it is of great importance to recollect in the hygienic treatment of elderly people. Nor should the relatively limited digestive powers of the opposite extreme, in early infancy, be forgotten when, in spite of its great assimilative power, the capacity of the stomach for acting on other than a milk diet is extremely small. Aberrations in diet at this period are, however, more frequently the causes of acuter diseases of the gastro-intestinal canal than of simple failure in the metamorphosis of the food.

Impairment of the functions of the stomach may also be more directly produced by *states of the system*, associated with more or less permanent conditions of *depressed vitality*, such as are sometimes observed from the effects of hot seasons and relaxing climates, unattended by any appreciable condition of disease. Still more commonly they are found to result from other causes acting either through the nutritive fluids, or the nervous system, singly or conjointly. In some cases alterations in the blood may be apparent, as in *anæmia* and *chlorosis*; but in others, even when nutrition evidently suffers, these are less evident. Similar effects on the digestion may be due to exhausting discharges, hemorrhages, *leucorrhœa*, profuse suppuration, cancer in other organs than the stomach, indulgence in venereal excesses, loss of sleep, sedentary occupations, especially such as are associated with deficiency of light and air, long-continued and depressing moral emotions, and the *ennui* of insufficient occupation, mental or physical.¹

Simple loss of functional power is also produced by causes immediately affecting the stomach, such as excess of fluids taken at meals, especially when drunk warm, or by the abuse of narcotics, and of tea and coffee, by prolonged fasting,² by the undue use of condiments, which diminish the readiness with which the stomach is affected by its ordinary stimuli, by habitual constipation, and by undue mental or bodily exertion after meals.³

¹ One digests with the legs almost as much as with the stomach. (Chomel, loc. cit. p. 58.)

² The author has known severe and obstinate dyspepsia of the atonic kind induced by the habit of going without food from an early breakfast to a late dinner, and the cause appears explicable by the observations of Bidder and Schmidt, who found that the secretion of gastric juice was markedly diminished after long fasting. (Die Verdauungs-säfte, p. 41.)

³ This is not unfrequently a cause of more acute attacks, and will be referred to hereafter.

To these causes must also be added the indigestion which occurs in febrile states of the system, in which, as observed by Beaumont on Alexis St. Martin, "food taken in this condition of the stomach (see Pathology) remains undigested for twenty-four or forty-eight hours or more."¹

It must, however, be remembered that the powers of the stomach apparently vary considerably in different individuals, and that a "weak digestion" does not necessarily mean a diseased state as long as persons with this peculiarity recognize the physiological laws of their nature. Health may be maintained by such individuals by regulating their food according to their digestive capacities. They are, however, seldom able to bear with impunity efforts of mind or body equal to those which may be sustained by individuals of larger powers, inasmuch as their assimilation is commonly incapable of compensating for the increased waste. Exceptions, however, depending partly on variations in intellectual capacity or in muscular or nervous power, are frequently noticed contradicting this proposition.

THE SYMPTOMS of this form of disorder are:—

In the alimentary canal. A sense of weight or uneasiness in the stomach after food, occasioned by the slowness of the digestive process—symptoms which are often protracted for some hours after eating, and are frequently continued up to the next meal. This may afford temporary relief, but is in its turn followed by the same train of discomfort. The weight or uneasiness is in some cases felt behind the sternum, giving rise to a sense of dyspnoea, or to a feeling as if some foreign body were present in the oesophagus. It rarely, if ever, amounts to pain, though the condition in some patients, especially in anæmic, chlorotic, or hysterical women, may be accompanied by the complication of intercurrent neuralgia, and in others by an excessive amount of flatulence, giving rise to various degrees of gastrodynia or colic. Tenderness of the abdomen is as a rule entirely absent, and pressure not unfrequently gives relief to such pain as may be present, especially when this arises from flatulent distension.

The digestive powers are about equally impaired both for protein and amylaceous substances, but in many cases the former, when in

¹ Experiments and Observations on the Gastric Juice, Combe's edition, p. 92.

any excess, aggravate this condition: oily and fatty matters are also very prone to disagree, as also do soups and broths.

Further disturbances appear in the form of flatulence and of eructation, both of gas and also of portions of undigested food, which are often rancid and offensive (probably from butyric acid fermentation). They usually occur some hours after eating—differing in this respect from the acidity following immediately after the ingestion of food which is observed in some cases of nervous origin. The flatulence affects the stomach and bowels in about equal degrees of frequency, sometimes appearing in one more than in the other; but the fermentative changes originating in the imperfect elaboration of the food in the stomach are usually continued in the lower portion of the canal, the functions of which are generally simultaneously impaired.

Impairment of the appetite, though not invariably observed, is a very common feature of all the more marked forms of this complaint. There is frequently a disrelish for food of all kinds, even when exhaustion is felt for want of it.¹

Thirst is generally almost entirely absent, at least to any abnormal degree. In many cases there is a positive dislike for fluids, which not unfrequently (especially when taken with meals, or when nutriment is presented in a fluid form) are found to aggravate the dyspeptic symptoms.² The saliva is said in some cases to be increased (Todd); but this, as far as the author's observation extends, is not the rule in the state now being described.

The tongue is broad, pale, and flabby; pitted at the edges by the teeth; sometimes thinly furred; but becoming more thickly coated when irritation supervenes. The inner side of the lips and gums are pale, flabby, and sometimes spongy; the tonsils are occasionally enlarged, and the uvula and throat relaxed, giving to the voice a thickness and huskiness which the patient sometimes attempts to relieve by hawking and spitting. The breath is not unfrequently heavy and offensive, but not nearly to so marked a degree as in some of the irritative forms.

Constipation forms another prominent symptom; and though

¹ A very marked effect of long fasting is familiar to all under the title of having "overstayed the appetite."

² "Dyspepsie des liquides" of Chomel. This fact is easily explicable when we recollect that undue dilution greatly impairs the efficiency of the gastric juice, and that in the condition under consideration this secretion is naturally defective in power. See *ante*, p. 54.

primarily resulting from the participation of the secretions and muscular actions of the intestinal canal in the general condition of atony, it aggravates the state of the stomach in the manner before described, and frequently increases the anorexia. The delay of the fecal matter in the intestines also favours the liberation of gas, which, distending the weakened muscular coat, tend still further to diminish its propulsive powers; hence various circumscribed swellings frequently appear in the abdomen, giving a mingled tympanitic and dull resonance on percussion, and borborygmi are heard when by pressure or the irregular contraction of the bowels the gas is moved from place to place. These distensions are particularly liable to occur in the course of the colon, especially at its flexures in the right and left hypochondriac regions, where they not unfrequently cause a sense of fulness, tightness, pain, and dragging, which are often, though improperly, referred to the stomach, liver, or spleen. Pain from this cause is also occasionally felt in other parts, especially in the left side, at the insertion of the diaphragm into the ribs, or in the scapular regions.

The evacuations may be solid, dry, and hard, or scybalous, or frothy from fermentative action. They are usually paler than natural, and sometimes offensive; but unless an excess of animal food has been taken, this latter character is not so common as in some forms of inflammatory dyspepsia.

Diarrhoea, when irritation supervenes, may occasionally alternate with the constipation, but the latter is usually the most prominent symptom.

The circulation is depressed; the pulse is weak, soft, and easily compressible—slow when the patient is in repose, but easily excited on the slightest exertion. Palpitation is common; it occurs irregularly, and independently of organic disease of the heart, and is easily induced by slight exertion, but it frequently arises spontaneously without previous physical or mental effort. It is in many cases directly traceable to flatulent distension, though occasionally it occurs without any distinct evidence of this state. Intermission of the cardiac action, though not so common as palpitation, is also not unfrequent.¹

Dyspnoea is a result not only of the cardiac state last described,

¹ It may be noted here that a large number of patients who believe, from the symptoms here described, that they are suffering from disease of the heart, are only subject to this form of dyspeptic derangement.

but frequently occurs independently of it. The feeling is one of load or oppression in the upper part of the chest, and especially across the middle portion of the sternum, impelling the patient to sigh or to draw a deep breath, in order to relieve this sensation, which, however, speedily returns. Cough is occasionally caused by an elongated uvula, but the irritative cough frequently described as caused by disorders of the stomach is not usual in this form of dyspepsia.

Except in cases where indigestion is directly due to a febrile state, the course of this affection is singularly free from pyrexial symptoms; the skin is soft, flabby, clammy, and moist, and the extremities are frequently cold, particularly after meals. The complexion is often pallid, sallow, and muddy.

The nutrition suffers more by an aggravation of the anæmia or atony which may be present, than by any direct emaciation—a symptom which occurs more rapidly in the inflammatory and irritative forms.

The urine, as a rule, is but little affected; it is usually clear and copious, and contains but little urea, unless some direct causes of enfeeblement of the constitution, producing excessive waste, are present. Under the latter circumstances the urea may be greatly in excess of the normal amount. If irritation supervenes, other changes may occur in this fluid, which will be again alluded to when these conditions are described.

The nervous system indicates in many ways not only its affection by the general state of the system, but also by the special conditions of indigestion. Languor and inaptitude for exertion, and a sense of weariness in the limbs, which are most evident after meals, are often the earliest, and sometimes during a long period the only, symptoms of the disturbed functions of digestion. They sometimes pass into an almost unconquerable drowsiness after food, which, when yielded to, affords a heavy but unrefreshing sleep. There is frequently an impairment of the intellectual faculties,¹ which, though more marked during the period of digestion, also continues at other times, and chiefly affects the memory and attention; the temper also is apathetic and timid.

The duration of this condition is very indefinite, depending, as it does, in a great measure on the persistence of the causes in which

¹ Sir J. Clark lays great stress on this diminution of the intellectual powers (*Climate*, ed. 1830, p. 257).

it has its origin. If these be removed, and a healthier state of general nutrition be restored, the stomach may, in some cases, easily regain its tone and functions, but in other instances a marked diminution of the digestive powers may persist long after the original cause of disturbance has been removed.¹

Sometimes the combination of weakened nutrition and diminished functional power conduces directly to further changes, excited by the irritant action of the undigested food on the mucous membrane, and giving rise to phenomena of a more or less inflammatory character. These not only greatly aggravate the original symptoms, but tend materially to prolong the duration of the disorder; the progress of which is frequently varied by acute exacerbations attributable to this cause, and which, it is important to remark, may also be brought into operation by medicinal stimulants administered without sufficient caution.

PATHOLOGY.—The form of disorder of the digestion now under consideration rarely depends on conditions by which the stomach alone is affected. It is with so much greater frequency associated with general states of the system characterized by the terms **ATONY** or **ASTHENIA**, that its pathology, in the majority of instances, only forms a part of that of the constitutional states signified by these names, which, if not in all cases capable of precise logical definition, have nevertheless a tolerably distinct meaning. At present they are generally understood to signify a simple impairment of the functional powers of an organ or tissue unattended by appreciable anatomical alterations. In relation to these, however, it requires also to be stated, that as healthy function presupposes and absolutely requires for its performance a healthy condition of nutrition and innervation, so in most of the cases distinguished by simple diminution of power, but unattended by other marked derangements of function, both the nutrition in a molecular sense and also the chemical constitution of the tissues are more or less impaired or perverted. In many instances, however, the nature of these finer alterations is at present unknown; and if in some cases the defect in the vital action is referred to disturbances in innervation, we are only carried back a step further to an inquiry of the same character, concerning the condition of the nervous structures, and where the same as yet unsolved problem confronts us.

¹ See a remarkable case of this kind recorded by Andral, of dyspepsia originating in the habit of masturbation (*Clin. Méd.* ii. 193).

MORBID ANATOMY.—Though in a certain number of cases of atony or asthenia the inference of mal nutrition underlying this state is rather a matter of induction than of positive proof, there is yet a large class where it appears to depend directly on appreciable anatomical alterations of the nature of atrophy or degeneration, the vital phenomena exhibited by which are frequently clinically undistinguishable from those of the former order to which we have alluded.

In this class may, therefore, be first mentioned those forms of simple atrophy of the mucous membrane of the stomach, associated with marked thinness and transparency of its walls, which have been mentioned by earlier, and even by some modern, writers, with very little reference to their clinical significance but which, as has been shown by the researches of Dr. H. Jones,¹ Dr. Habershon,² Rokitsansky,³ Dr. Fenwick,⁴ and the author,⁵ are often combined with fatty degeneration and wasting of its tubular structures. These have been found in many instances to have been replaced by a greater or less amount of fibro-nucleated tissue, and this change has been observed by Drs. Handfield Jones, Habershon, and the author,⁶ to be in many cases associated with distinct loss of power in the digestive functions during life; while Dr. Fenwick has proved that in such cases the digestive powers of the mucous membrane after death are also markedly diminished.⁷

Both Drs. H. Jones and Fenwick have shown that these conditions may occur independently of inflammatory action. The

¹ Path. Soc. Trans. iv. and v., 1853-4. Med.-Chir. Trans., 1864. Diseases of Stomach, 1855.

² Guy's Hosp. Rep. 3d Ser. ii. 1855. Observations on Alimentary Canal, 1857.

³ Pathologische Anatomie.

⁴ Morbid Changes in Stomach and Intestinal Villi in Persons dying of Cancer: Med.-Chir. Trans., 1865.

⁵ Contributions to the Pathology of the Glandular Structures of the Stomach: Med.-Chir. Trans., 1858.

⁶ In a former paper of purely pathological investigation into the subject, before quoted, I stated that I had not then had the opportunity of tracing the clinical histories of the patients whose stomachs I had examined. Since that period I have, however, been able to trace in several instances the concurrence of anorexia and loss of digestive power with these conditions of degeneration. Dr. Fenwick has recently published a case (*Lancet*, 1870, ii. 78), where atrophy of the glands was general throughout the whole of the mucous membrane of the stomach; and where the patient, a gentleman *ætat.* 45, died with gradually increasing exhaustion. Vomiting also occurred. Dr. Fenwick found the digestive power of the mucous membrane markedly diminished.

⁷ In Dr. Fenwick's cases the stomachs so altered showed scarcely any traces of self-digestion, and the mucous membrane, after the addition of hydrochloric acid, when digested with 10 grains of albumen, dissolved only $\frac{1}{8}$ of a grain, whereas 31 grains of albumen digested similarly with a healthy stomach lost four grains.

author's researches have, however, convinced him that such degenerations are produced with great frequency in the stomach, as in other organs, through the destructive effects of this process upon its tissues, and that therefore in many instances simple atony may be regarded as the result of a pre-existent inflammation, though not necessarily indicating its continuance as a cause of the state—a proposition which affords pathological evidence and support to clinical observations on diseases of the stomach, where irritative action has often been known to be followed by long-continued asthenia.

In several of Dr. H. Jones's¹ cases the changes in question were met with at advanced periods of life, and probably belonged to the category of senile degenerations. Dr. Fenwick has also pointed out that in the cases in which he observed these alterations in the stomach analogous degenerations had occurred in other tissues, and especially in those of the vascular system.²

Closely allied to these conditions of degeneration are those where the digestive power is weakened and sometimes almost completely abolished by inflammatory or febrile conditions of the system, and of which Beaumont's observations on Alexis St. Martin gave very distinct evidence.³ Histological investigation also reveals in the stomach changes similar to those discoverable under these circumstances in other glandular organs, as well as in the heart and voluntary muscles. The epithelial cells are granular and disintegrate easily, evincing a tendency to a retrograde metamorphosis, or defective nutrition by which their functions are impaired or diminished. The condition is, indeed, one which it is not always easy to distinguish from the earlier or minor degrees of recent inflammatory change; but there can be very little doubt that molecular softening and granular disintegration may occur independently of this process. Tissues thus weakened in their nutrition are, however, liable to undergo, from the slightest causes, a more destructive processes associated with vascular disturbance, to which the author believes that the name of "Inflammation" may still, in the present

¹ See especially pp. 96, 107, 113, 126.

² Dr. Fenwick's observations were chiefly made upon patients dying of cancerous disease of the breast. As catarrhal conditions of the stomach are very common in cancerous disease, even when this organ is not affected by the growth (see Lebert, *Traité des Malad. Canc.* 115), the degenerations found by this author may possibly have been the result of past inflammatory conditions.

³ See also Bernard's confirmation of this evidence, *Arch. Gén., Suppl.*, 1846, pp. 8 and 204.

state of our knowledge, be applied; and therefore, while some of the forms of the so-called dyspepsia febrilis belong to simple atony from arrested nutrition, another and a very large class, to which allusion will be made hereafter, require to be classed under those having an inflammatory origin.¹

DIAGNOSIS.—The difficulty in the diagnosis of all varieties of dyspepsia depends on the fact before alluded to, that the symptoms arising from imperfect changes in the food are common to all conditions in which these may originate. The discrimination of the form now under consideration depends chiefly on the absence of the evidences of organic affection and of severe nervous derangement, coupled with the etiological circumstances of its origin. It is essentially a chronic affection, and therefore is mainly to be distinguished from chronic catarrhal inflammation. The leading characteristics of atonic dyspepsia in contradistinction to those of chronic catarrh are—(1) The minor degree of gastric uneasiness, and the absence of epigastric tenderness; (2) the simple deficiency of appetite, and the absence of thirst; (3) the absence of pyrexia; and (4) the condition of the tongue, which exhibits no signs of irritative action of the gastro-intestinal tract, but is pale, broad, and flabby. The constitutional symptoms are also less severe, and the course of the affection is more uniform.

The diagnosis from cases of ulcer and cancer is easily made when in these affections pain, vomiting, and hæmatemesis are present. In the earlier stages of cancer the symptoms may closely simulate those of simple atony, in loss of appetite and of digestive power, and sometimes it is impossible to obtain absolute certainty in diagnosis. The conditions which would attract suspicion of the more serious disease are failure of appetite, loss of strength, anæmia or other signs of cachexia commencing without manifest cause in a person who has passed the age of forty. Pain, when not traceable

¹ Beaumont's description is so graphic, and possesses the so infinitely great advantage of being drawn from life, instead of from more dubious post-mortem changes, that it appears well that it should be again quoted *in extenso*, especially as it affords convincing proof that the two distinct conditions of the stomach may exist under these circumstances; the one irritative, the other atonic:—

"In febrile diathesis, or predisposition from whatever cause, . . . the villous coat becomes sometimes red and dry, at other times pale and moist, and loses its smooth and healthy appearance; the secretions become vitiated, greatly diminished, or entirely suppressed; the mucous coat scarcely perceptible, the follicles flat and flaccid, with secretions insufficient to protect the vascular and nervous papillæ from irritation."—*Loc. cit.* p. 98.

to intestinal colic, should always excite suspicion of a more serious disorder than simple functional dyspepsia.

THE PROGNOSIS of atonic dyspepsia varies with its etiology. Cases where the disorder is of purely functional origin, and where it has been induced by causes acting directly on the stomach, are usually amenable to treatment. When, however, the defective digestion is only a part of a more general condition of the system, the restoration of the powers of the stomach must depend on the possibility of improving the health of the patient, and of removing the conditions which have induced the disease.

Cases also where there is any suspicion of degenerative changes in the glands, as in obstinate atonic senile dyspepsia, or where symptoms of indigestion persist after long-continued inflammatory or catarrhal conditions of the mucous membrane, have necessarily a much more unfavourable aspect than those where the state is one of mere functional inactivity.

When connected with or arising from anæmia, the result of organic disease in other organs, atonic dyspepsia, though seldom immediately fatal, not unfrequently proves a most serious complication of the original disorder, tending, with a rapidity proportioned to its severity, to further impair the strength and the general nutrition of the patient. When uncomplicated it rarely appears to act directly as a cause of secondary diseases, but it seldom continues long without passing into some of the irritative forms, and the effect of these is not only to maintain, but also to aggravate, the original condition of defective digestive power. The injury which it causes to the general nutrition may however predispose to disease in other organs, as the lungs, brain, heart, or kidneys, according to the several liabilities of each of these as a *locus minoris resistentiæ* to other injurious influences which may come into operation. I confess, however, that I am indisposed to entertain the opinion that simple functional impairment of the powers of the stomach has any tendency directly to induce the more serious organic diseases of this viscous, such as ulcer and cancer.¹

THE TREATMENT of this form of dyspepsia is comprehended under the title of Tonic, and implies the use of all such agencies as are capable of increasing functional power by restoring the con-

¹ This opinion has been expressed by M. Beau, *Gaz. des Hôp.* 1859.

ditions of healthy nutrition; indications which are to be fulfilled by measures adapted—

1. To improve the quality of the blood, and to regulate its transmission, by means of suitable diet, by medicinal agents capable of altering its composition, when this is defective, and by re-establishing the digestive and nervous powers.

2. To enable the system to appropriate and act upon the nutrient conveyed to the tissues, through methods calculated to favour healthy metamorphosis and the elimination of effete products. Our object is thus simultaneously to increase the vigour of the system and also of the stomach; since it must be remembered that, while the due performance of the functions of the latter is essential to the nutrition of the body, yet, on the other hand, a permanent increase in the powers of any single part cannot take place without a healthy condition of the whole system.

The treatment directed to these objects may be conveniently divided into regiminal and dietetic, and medicinal.

(a) Regiminal and dietetic.

As regards diet, the primary necessity is to administer the most easily assimilable food, and at the same time to avoid overloading the stomach, and thus aggravating the existing weakness, or exciting inflammatory irritation.

In cases of great impairment of the digestive powers arising from pyrexial conditions, hemorrhages, long privation, or exhausting discharges, food must be given in very small quantities at short intervals. Milk, and strong beef-tea, and animal jellies, combined with alcoholic stimulants, are the forms that should be selected for this purpose.¹

For the less severe but more frequent forms that are met with in the dyspepsias of the sedentary, or of those subjected to mental strain or anxiety, the main outlines of diet only can be sketched in this place. Three moderate meals daily are usually sufficient, but a fourth may occasionally be permitted on retiring to rest. A cup of tea may, however, often be taken with advantage before rising in the morning. The food chosen should be varied, but selected for its digestibility.

¹ The methods recently proposed by Dr. Marcet ("On a New Method of Preparing Meat for Weak Stomachs") and by Dr. Pavy (*loc. cit.*), of subjecting animal food to artificial digestion before its administration, may prove to be beneficial in these cases.

Fresh-cooked meat should be eaten at least twice daily. Beef and mutton, and game, with the exception of hares and rabbits, are to be preferred. Chicken, calves' feet, sweetbread, and tripe may also be permitted; but pork and veal, and salted or preserved meats, should be excluded. Eggs, when they agree, are to be recommended.

Fish is less desirable, but may be eaten with moderation. Oysters often are found to agree well; but differences in this respect are observed in individual cases.

Vegetables should by no means be excluded; but caution is requisite in their use. When they cause much flatulence, their place may be supplied by rice or macaroni, and by some fruits, especially by grapes, strawberries, and stewed prunes. Potatoes should always be well boiled, and not eaten too young. Other vegetables should also be fresh, and carefully boiled. Turnips, parsnips, Jerusalem artichokes, onions, and the Cruciferae often disagree; but spinach, vegetable marrow, beetroot, young peas, and French beans may commonly be taken.

Bread should not be eaten new. Aërated bread often agrees better than the ordinary forms. Biscuits or toast are often, however, preferable. Fresh butter may also be eaten in moderation.

Pastry is to be eschewed; but light farinaceous puddings generally agree well. Fried dishes should be forbidden, and in the same category must be placed the Crustacea, and nuts, pickles, and cheese.

Much fluid at meals should be avoided. Cocoa made from the nibs, or milk and water, may be taken when tea and coffee disagree. A moderate quantity of wine should however be taken twice daily.¹ The selection may commonly be left to the patient, unless under special circumstances. Sherry, claret, hock, and champagne generally suit the best. Malt liquors are only to be used with caution, as they often cause flatulence.

Sugar² may be used in moderation; but other condiments are to be avoided, except in the case of elderly people, or of those habituated to their use, since they have been shown to possess very little

¹ Bernard, *Leo. Phys. Exp.* ii. 420, has shown that diluted alcohol is one of the most effective stimulants to the secretion of the gastric juice.

² Independently of its value as an article of diet, sugar has been shown to be an effective stimulant of the secretion of the gastric juice (Blondlot, p. 223).

power of increasing the amount of gastric juice, and are liable to cause irritation.

The *general regimen* must also be tonic, including under this head sufficient rest¹ both at night and also after meals; the avoidance of hot, ill-ventilated apartments, both in the day and at night; and the spending as much time as possible, consistently with the avoidance of undue fatigue, in the open air. Travelling, especially in open carriages, yachting, or sea-voyages, frequently prove highly beneficial in cases marked by much weakness, while for those of less severity horse exercise is as a rule more advantageous than walking. Exercise, especially in the open air, pushed to a degree short of producing exhaustion, has probably a greater influence in increasing the digestive powers of the stomach than any other single measure: hence for those who of necessity lead sedentary lives in large cities the use of gymnasia often proves of great service, by bringing into play a larger proportion of the muscular system than is exerted in mere walking. It must, however, be remembered that exhaustion is to be most carefully avoided, and that after any active exercise a sufficient amount of time should be allowed to elapse to allow the body to cool and the nervous system to repose before food is taken.²

The influence of the intellectual and moral functions on the digestive powers is so marked that it cannot escape notice in this place; and it should always be recommended to patients harassed by care or anxiety, as well as to those engaged in absorbing intellectual pursuits, to take their meals in cheerful society. In many such cases, however, a complete cure is unattainable, except by a change of thought and scene.

The effects of cold bathing will, as a rule, be beneficial or not according to the powers of reaction of the patient. It is decidedly injurious when this is not speedy, and complete and lasting, and even in some of the latter class the exhaustion following the bath more than compensates for the temporary pleasure derived from its use. A healthy state of the skin being, however, a great object, a tepid bath taken daily, together with the use of the hair-glove or flesh-brush, should be strongly recommended. A residence even

¹ The importance of perfect rest is shown by a case of Andral's (Clin. Méd. ii. 191), when a condition of atony supervening upon irritative dyspepsia was only finally cured by retaining the patient for more than two months in bed.

² If exhaustion is felt after exercise, it is often advantageous to take a small quantity of an alcoholic stimulant a short time before the food.

temporarily in a dry and bracing climate is frequently of the highest value. The air of Brighton often proves of great service when there is no irritability of the mucous membrane; and next in order may be placed Scarborough, Dover, Folkestone, Margate, Eastbourne, Malvern, Tunbridge Wells, and the Surrey Downs; Ilfracombe, on the western coast, also possesses many advantages. A high situation, on a porous soil, is that which in general is best suited to patients of this class.

(b) As a prelude to all discussion of the effects of medicinal treatment for this disorder, it is not unimportant to state that, although often proving of great value as adjuvants of the general hygienic measures which have now been indicated, the employment of drugs independently of these is of comparatively little service. Even under any circumstances, no little caution is necessary in the selection, doses, and mode of administration of medicinal agents, in order to avoid the causation under their influence of irritative conditions, which are peculiarly liable to supervene in tissues whose vitality and power of resisting external impressions is already below the healthy standard.

The objects to be fulfilled by therapeutic measures may be conveniently summarized under the following heads:—

(1) Tonics to permanently increase the powers of the organ and of the system generally.

(2) Stimulants or stomachics to increase the secretory powers of the stomach, and which, by thus accelerating the digestive process, act indirectly as tonics, by favoring the assimilation of nutritive materials.

(3) Adjuvants to supply materials in which the gastric juice may be presumed to be defective.

(4) Certain remedies for special symptoms or conditions, which may not only hinder the digestive process, but may interfere with the comfort of the patient.

When anæmia is present, the use of iron is strongly indicated; but its action is less marked in cases of functional debility unattended by this state. The carbonate, the potassio-tartrate, the ammonio-citrate, or the ferrum redactum usually suits the best; but when there is much relaxation of the tissues, the tincture of the perchloride or the sulphate may be used. The former may be given before meals, the two latter should be taken immediately after food. If these preparations disagree, the lactate or the syrup of the pyro-

phosphate may be sometimes resorted to with advantage. Parrish's acid syrup of iron and lime often agrees well with children, to whom also the *vinum ferri* is well suited. When constipation is a marked symptom, and also in females whose menstruation is scanty or infrequent, iron may often be combined with advantage with one or two grains of the watery extract of aloes.

In other instances the natural mineral waters of Tunbridge Wells, of Spa in Belgium, or of Homburg, Kissingen, or Schwalbach, prove of greater efficiency than any pharmaceutical preparations; and their beneficial effects are probably much assisted by the advantages resulting from the change of scene and of the mode of living, which those experience who visit these places from distant parts.

It should be mentioned as a caution, that in conditions of gastric irritability iron is usually tolerated with difficulty; and that some preliminary treatment is often necessary before, even in atonic dyspepsia, its administration is attended with advantage. It may often be advantageously combined with mild aperients, of which the aloetic class are generally the best, and particularly in the case of chlorotic females.

Much caution is requisite in resorting to the vegetable bitters, many of which, though increasing the appetite, appear to have little or no influence in augmenting the digestive powers,¹ and, further, have frequently a considerable tendency to cause irritation of the stomach. Their effect as tonics, in any general sense of the term, appears also to be of a very questionable nature.

Two remedies of this class have, however, a more distinct general and a more persistent local effect, and therefore appear to deserve a place among the true tonics, viz., *nux vomica*, or its alkaloid strychnia, and quinine. The former of these often proves a most valuable tonic remedy, improving apparently the nervous energy of the stomach, as well as that of the system at large. Thus in many cases, by increasing the muscular contractility of the stomach and intestines, it aids (in addition to the antiseptic effects common to all bitters, but largely possessed by strychnia) in preventing the

¹ See on this subject Buchheim's "*Arzneimittellehre*," p. 42; Shrenk, "*De Vi et Effectu quorundam Medicaminum in Digestionem*;" Diss. Inaug., Dorpat. 1849; Clarus, "*Arzneimittellehre*," p. 1014. These authors have remarked that the increase of the appetite is only due to local irritation—an effect which, as Griesinger, *Arch. Phys. Heilk.* vi. 399, has shown, results equally from small doses of many of the more irritant metallic poisons.

distension by flatus, which is so common and distressing a symptom in the cases now under consideration.

The most convenient mode of administering it is in the form of the tincture, in doses of from five to ten drops with infusion of orange-peel and syrup; and it may be advantageously combined with the mineral acids, in cases which appear to require the administration of these remedies. Its use in many of the painful neuroses will be further alluded to when they are treated of.

Quinine is a more doubtful remedy in stomach affections, though at times it undoubtedly does good service. Its tendency to cause headache, and nausea and irritation of the stomach, requires caution where any signs of the latter condition exist. Still, in cases of convalescence from severe diseases, when the tongue is clean, but pale, broad, and flabby, and there is little tendency to constipation or to congestive headache, and also in persons of lymphatic constitution with relaxed conditions of the system, it often proves of value. It may be given in pill or powder, in doses of one or two grains, taken daily before or with meals, or in the form of the tinct. cinchonæ composita, or Battley's liquor cinchonæ, both of which preparations often appear to agree better than the pure alkaloid. In other cases, where iron is simultaneously indicated, the ferri et quinae citras may be resorted to.¹

The other remedies of the class of bitters appear to rank rather among the stimulants and stomachics than with the tonics as above described. They may therefore be conveniently subdivided into four sub-classes, viz., simple bitters, aromatic bitters, aromatics, and stimulants² to the gastric secretion of a more general character.

¹ Quinine more frequently disagrees when given in solution in conjunction with sulphuric acid; a combination rarely indicated, but which, as it appears to me, is too frequently employed.

² It is important in relation to this subject that the varied effects of different agents on the gastric secretions should be constantly remembered. Blondlot, (*Traité Analytique*), Bernard (*Arch. Gén.* 1846), Corvisart (*Longet's Physiologie*, 1861, p. 184), have shown that the most active agents of this nature are alkalies (and in this respect the effects of the alkaline saliva must be remembered), cold water, diluted alcohol, ether, sugar, absinthe, chicory, ipecacuanha, nitrate of bismuth, and diluted solutions of common salt. To these Corvisart adds black coffee, the effects of which must appear, however, somewhat doubtful to those who are acquainted with the almost total arrest of digestion which sometimes follows its use. Its effect appears to be of an opposite character in different classes of patients, suiting well the lymphatic temperament, but injurious to persons of nervous excitability. See Trousseau et Pidoux, *Traité de Thérap.*, ii. 533. Stronger stimulants, such as cathartics (Blondlot, loc. cit. p. 213; Beaumont, loc. cit. p. 182), powdered salt (Bardleben and Frerichs, loc. cit. art. "Verdaunung," p. 788), condiments (Beaumont and Buchheim and Engel), and even mechanical irritants, as charcoal (Corvisart), produce a large amount of mucous secretion, either alkaline or feebly acid, but possessing but small digestive powers.

The simple and aromatic bitters have the greatest influence in increasing the appetite, and when this is defective their administration is especially indicated, but with the caution that loss of appetite is not always to be relied on as a diagnostic symptom of atonic dyspepsia, but is common in many inflammatory diseases of the stomach, when the use of these remedies is prejudicial. The effects of many of these are familiar enough to the profession, and also to the public, especially in the use of infusion of quassia before meals; and chiretta appears to have a very similar action.¹

Judging from the researches of Corvisart, it would appear that the aromatic bitters, in addition to their powers of increasing appetite, have a greater influence in promoting gastric secretion than those last named; and among the principal remedies of this nature may be enumerated absinth, hop, chamomile, cascarilla, and calumba.

Of these, calumba holds the chief place in point of therapeutic value, as a remedy which can be safely employed when others of the class would be too irritating.² It may be used as an infusion or tincture, and the former may often be advantageously administered in conjunction with other aromatics, or with acids, alkalies, or ferruginous preparations; but when a more active effect of the same character is required, other remedies of this class may be resorted to with benefit.

As regards the more direct stimulants, their administration is indicated before or with food. The effects of a moderate quantity of wine in aiding a weak digestion have been already alluded to; and bitter beer, combining the aromatic and bitter qualities of the hop, often proves of service in milder cases, where flatulence is not one of the symptoms complained of. Where, however, there is a tendency to fermentation of the food, malt liquors are distinctly contra-indicated.

Another remedy of the same class, ipecacuanha, originally prescribed by Daubenton, has of late been brought into more common use by the advocacy of Dr. Budd. It should be given in pills, in

¹ Of gentian it should be observed, that though possessing the advantages of a laxative in addition to those of a bitter, its characters as an irritant are more marked, and that additional caution is therefore requisite in its use.

² Calumba appears to possess some direct "sedative" properties; thus it is sometimes useful in the vomiting of pregnancy and in sea-sickness, and even in minor degrees of subacute inflammatory action, and it has been known to check the vomiting caused by tartar emetic (Pereira).

doses of half a grain to one grain before meals, and may often be combined with advantage with three or four grains of rhubarb.

Other combinations of the same kind occasionally prove useful, such as chamomile¹ together with rhubarb and ginger. Cayenne pepper is sometimes employed in the same manner, but its use is less advisable. The value of alkalies when taken during meals, in the form of Vichy water, liquor potassæ, or the carbonates of potash and soda in combination together with wine or malt liquors, is probably in some degree attributable to their physiological effects on the secretions of the gastric juice. They have also been employed for the same object by my friend Dr. George Harley, in small doses, properly diluted, before meals, with good effects in promoting digestion.²

As *adjuvants* to the process of digestion two series of agents deserve especial mention, viz., the mineral acids and pepsine.

The efficacy of the former of these has been long known. Their use is not however limited to cases of simple atony, but they sometimes prove serviceable in many cases of irritative dyspepsia when from inflammatory causes the secretion of gastric juice is defective, and to which fuller reference will hereafter be made.

Of these acids the hydrochloric stands undoubtedly the first in point of utility—a fact which is easily comprehensible from its being probably the most active agent in the normal process of digestion. It should be taken, in doses of from fifteen to twenty drops of the dilute acid of the British Pharmacopœia, suitably diluted with water, immediately before, or during, or directly after a meal. It may be rendered more palatable by the addition of syrupus aurantii; and may often be very advantageously combined with some of the bitter remedies before mentioned, especially with the tincture of nux vomica, the liquor cinchonæ, or the infusion of calumba. Employed in this manner it will often, in the less severe cases, be found to relieve the sense of weight and distension ensuing after food. It frequently also prevents the acidity and flatulence arising from the fermentation which results from the imperfect action of the gastric juice, though it must be considered

¹ Chamomile has the advantage of possessing slightly laxative properties, and is said by Troussseau (*Traité de Thérap.*) to be very beneficial in the atonic and flatulent forms of gouty dyspepsia.

² The effect, as Blondlot and Bernard have shown, of the administration of a small amount of diluted alkali on an empty stomach, is to cause a secretion of gastric juice, much greater than is sufficient to neutralize the alkali.

problematical whether in these doses it has the intrinsic power of checking this process which Liebig¹ attributes to the stronger mineral acids, and to which Pemberton² ascribed their influence on the relief of flatulence.

The phosphoric and nitric acids have been recommended for the same purposes by other writers (Todd, Pemberton), but their influence in aiding digestion is much less marked than that of the hydrochloric, while nitric acid not unfrequently produces irritating effects on the stomach, and may give rise to pain or nausea.

Dr. Handfield Jones³ has for similar purposes found the use of lactic acid, as recommended by Majendie,⁴ to be productive of good results; he administers it in doses of fifteen to twenty drops, suitably diluted, at meal times, and, in some cases of irritative dyspepsia, he considers it decidedly preferable to the hydrochloric.⁵

Though the efficacy of pepsine has occasionally been called in question by some recent writers, my own experience would induce me to bear a strong testimony in its favour—not only in the form of dyspepsia now under consideration, but also in some conditions when the digestive process is impaired by irritative states of the mucous membrane. It may often be very advantageously taken simultaneously with hydrochloric acid at meal times.

The complications of atonic dyspepsia which most call for medicinal relief are constipation, flatulence, and acidity.

In remedying constipation much care is required to avoid irritation, and only the gentlest and least irritating laxatives are desirable. When possible, even these should be dispensed with, and the action of the bowels, when not occurring spontaneously, should be daily solicited by the use of enemata of cold water.

Friction, or the wet compress worn at night, protected by a piece of mackintosh, or the use of the cold douche to the abdomen, are often useful adjuvants in this respect.

¹ Animal Chemistry, p. 386. ² Diseases of the Abdominal Viscera, p. 122.

³ Functional Nervous Disorders, p. 420.

⁴ Formulaire pour la Préparation et l'Emploi de plusieurs nouveaux Médicaments. 1836.

⁵ Hünefeld's experiments under Budge, "De Albuminis Succo Gastrico factitio Solubilitate," showed that hydrochloric acid gave the greatest digestive powers, lactic acid less, and acetic acid the least (Canstatt, 1859, i. 30). Trousseau's clinical experience of the relative value of the mineral acids indicates a decided superiority on the part of hydrochloric (Clin. Méd. ii. 377). Meissner also has found that, in artificial digestion, it is necessary to use ten times more lactic than hydrochloric acid to produce a digestive mixture of the same strength (Henle and Pfeuffer's Zeitsch. 3d Ser., vol. vii. p. 16).

When medicines are used, rhubarb and aloes are to be preferred to all others. Either may be given with food, a method which diminishes to some degree the danger of irritation resulting from their use, and they frequently may, with advantage, be combined with small doses, as a quarter of a grain, of the extract of *nux vomica*.

Recourse should however be had as little as possible to purgative remedies, for it may become difficult afterwards to shake off the habit of requiring their aid, and the use of strong aperients tends still further to exhaust the muscular and nervous powers of the intestines. In many cases of atonic dyspepsia, when there is any considerable degree of general debility, there is very little occasion for a *daily* action from the bowels, but care should at the same time be exercised to obviate any undue accumulation of feces in the intestine.

When acidity and flatulent spasm exist together with the constipation, antacids, and especially the *magnesia usta*, or *magnesiae carbonas*, in combination with *tinct. rhei* and aromatics, may be employed with advantage for the same objects. In severer cases, especially in the gouty flatulence of elderly people or of females at the climacteric period, *assafoetida*, either in combination with aloes or in the form of the compound galbanum pill, is frequently of considerable service. If the flatus exist in the stomach, large draughts of warm water may sometimes prove efficacious in promoting its expulsion, by eructation;—while tympanitic distension of the bowels may be relieved by enemata containing turpentine, *assafoetida*, *oleum rutæ*, or sometimes by infusion of chamomile.

Other remedies for flatulence may at times be employed, though they only act as very temporary palliatives, such as the more cordial aromatics, the *spiritus ammoniæ aromaticus*, the *aqua anethi*, or peppermint water. In some cases the absorbent powers of charcoal are of service, though to possess any efficacy of this kind it is necessary that it should be recently prepared.¹

It must be remarked that no single plan of medicinal treatment should be too continuously protracted, and that a change of remedies within the limits of those above indicated is often productive

¹ Belloc, who first introduced it, recommended that it should be made from the young shoots of the poplar, and stated that, given in doses of from 30 grains to 3 drachms in the twenty-four hours, it acted slightly as a laxative. Dr. Leared has of late praised the efficacy of the charcoal made from vegetable ivory for this purpose.

of good effects. Many that seem at first beneficial appear after a time to lose their efficacy, and may be advantageously replaced by others of a different class according to the predominance of individual symptoms; and even the ferruginous preparation, on which so much stress has been laid, should not be persisted in without intermission.¹

The period during which bitter remedies prove efficacious is equally limited. Preparations of *nux vomica* or *calumba* are tolerated longer than most of the others, but the prolonged administration of the former may entail nervous accidents and dangers of over-excitability of the spinal cord, which may sometimes persist to an unsafe degree after the discontinuance of the drug; and even when its use is beneficial it should seldom be persisted in longer than a month or six weeks. If the favourable effects of bitter remedies do not become apparent after a few days, it is better to discontinue them; and under all circumstances it is necessary to watch closely for signs of gastric irritation, since if these are present they are generally aggravated by this class of remedies.

II.

NEUROSES OF THE STOMACH.

SYNONYMS.—*Erethism of Stomach* (Barras and Trousseau), *Gastralgia* (Barras, Valleix), *Morbid Sensibility of Stomach?* (Whytt, Johnson).

Although, as has been already observed, derangements of digestion depending on impairment of the influence of the nervous system are very numerous, and often present no other features than those which have been described under the head of Atonic Dyspepsia, there nevertheless exists a large class of disorders of the stomach, which, arising from disturbances of its innervation, differ widely from the foregoing in many of the phenomena which

¹ Sydenham (*Op. Omnia*, Syd. Soc. Ed., p. 347) recommended their employment in hysterical or ataxic cases for a period of thirty days, and it is seldom that they can be taken with advantage for a longer period, though they may be resumed after an interval of ten days or a fortnight.

they exhibit. In spite, however, of their apparent dissimilarity, a full consideration of the etiological and pathological relationships of these two classes will, the author believes, tend to show that a closer analogy exists between them than might otherwise be supposed. It is true that the nervous disturbances which are now to be discussed frequently present symptoms of greater severity, yet their leading features—which may be described as consisting in an unnatural excitability, manifested either by extreme degrees of perversion of the functions of the stomach, or by an excessive exaltation of its sensibility—are found in the majority of cases to coexist with an impairment of its physiological powers. In exceptional instances, indeed, the signs of local weakness may be absent; but even in these, indications of a more general asthenic constitutional state can usually be found, which serve to establish the essential pathological identity of the whole class: the evidence in favour of which is further corroborated by the similarity of the conditions which, in both, have an almost equal influence on their causation, progress, aggravation, or cure.

The symptoms of these disturbances consist, for the most part, of pain, vomiting, or perversions of secretion and of the appetite and digestion, and some explanation has been already furnished in the chapter devoted to these subjects, of the relation borne by them to the special states now under consideration.

The immediate mechanism of the production of such conditions appears to depend in some cases on nervous disturbance, which may be designated as primary, but in other instances they originate from the disorders of other, and sometimes of distant parts, by which the functions of the stomach are affected in the manner just described as reflex.

ETIOLOGY.—The predisposing causes of disturbances of the functions of the stomach, resulting from perverted innervation, while embracing many of those general conditions which have been before enumerated as capable of inducing the atonic state, further include the special causes which are capable, in addition to weakness, of giving rise to extreme nervous excitability. We thus find that they are predominant in the female sex,¹ and occur with much

¹ Georget, art. "Gastralgie," *Dict. de Méd.*, x. 81, says that these nervous disorders are ten times more frequent in the female than in the male sex.

less frequency among men. They are, however, rare before puberty,¹ for with the exception of cases of vomiting from cerebral disease, and the rarer instances of simple uncomplicated reflex disturbance of the stomach arising during dentition, the periods of infancy and childhood are comparatively free from the severer forms of gastric disorder of a nervous character. The immunity thus enjoyed in the earlier ages of life is probably, in part at least, due to the absence of those profounder impressions made by moral emotions, which, as will be presently mentioned, serve in a great number of instances as their determining causes. They are less common at advanced periods of life than between the ages of fifteen and forty. A special proclivity at two different ages is, however, in the female sex determined by sexual conditions, the epochs of the appearance and cessation of the menstrual function being in them peculiarly liable to be marked by these disturbances; while in the male sex the only extraneous influences determined through age are such as result from the increasing anxieties and severer intellectual efforts which are often called for in those between thirty and fifty.

Hereditary disposition is by some writers mentioned among their predisposing causes, and there seems no reason to doubt its occasional possible influence in this direction.

Of the special determining causes, *exhaustion* plays the most prominent part, and when combined with other depressing influences, and particularly with those of a moral character and operating through the nervous system, such as grief, fear, anxiety, or severe intellectual effort, it is an almost unfailing source of perversion of the functions of the stomach, which can only be referred to disturbed innervation. These, however, may originate under almost any circumstances of impaired vitality or of diminished constitutional power, whether apparently spontaneous, as in the states of anæmia and chlorosis (which, though most common in the female sex, have been observed to be thus associated in men), or which may be produced by hemorrhage,² or by privation of food, by

¹ Some cases are, however, recorded by Dr. Handfield Jones (*Functional Nervous Disorders*, pp. 412 et seq.), where neurotic abdominal pain was observed in boys before and at the period of puberty (see especially one by Dr. Martin, of Rochester, *Brit. Med. Journ.*, July 16, 1859). In some, however, of these cases the pain appears to have been seated in the abdominal muscles rather than in the stomach.

² Thus, Whytt (*Works*, p. 568) mentions a case of a young man who was bled largely for a pain in the side, arising from a fall from a horse. After some days

venereal excesses, and particularly by the habit of masturbation.

Diseased states of the nervous centres may also act as causes of these perversions.² The chief facts which are known with respect to these relations have been already alluded to, and they do not thus far appear to require further description in this place.

By far the most frequent, however, of all the causes assignable as the starting-point of these disturbances, are the complex states expressed under the terms *Hysteria* and *Hypochondriasis*. Their frequency in hysteria may be estimated by the statement of Briquet,³ that of 358 cases of this affection, only 30 had no sign of "gastralgia," or "epigastralgia;" 130 had only pain at the epigastric region; while 187 had both pain and derangements of the digestive function: and this author states that the latter are among the first symptoms in females in whom hysteria is slowly developed.

The frequency also with which perversions of the moral and intellectual functions which are included under this title are found associated with all forms of dyspepsia may very properly give rise to the question, how far in all cases it can be regarded as standing to them in the relation of a cause, or whether in an almost equal number it is not either a direct consequence of the derangements of the digestion, or whether both these and the hypochondriasis are not together the expressions of a more general nervous disorder. There is, however, little doubt that, in whatever manner originating,

he was attacked by a sense of intense cold in the stomach, and this was followed by intense pain recurring in a paroxysmal form two or three times in the twenty-four hours. The attacks continued for some weeks, but he gradually recovered under the use of "stomachics;" but having on another occasion experienced a similar, though smaller, loss of blood, the attacks of pain returned, but in a less severe degree. See also a case where pain and acid vomiting occurred after attacks of hemorrhage from piles (Budd, p. 198). Hemorrhoids in hysterical women are capable of producing extreme reflex disturbance of the stomach. In a case lately under my observation these ceased after the removal of the immediate exciting cause.

¹ Georget, *Dict. de Méd.*, x. 84. Andral, *Clin. Méd.*, ii. 193. Schmidtman, "De Cardialgia," *Summ. Obs. Méd.*, vol. iii. p. 191, says—"Raro infantes puerosque invadit, crebrius juvenes et juvenas, atque eos in primis quando fœdæ deliterisque esse addixere masturbationi: inde cardialgia in juvenibus obvia mihi semper suspitionem movet eos masturbari, atque disquisitione institutâ rarenter à vero aberravi." *Ibid.* iii. 205.

² Both gastric pain and vomiting may be excited by cerebral hemorrhage, so as even to give rise to suspicions of poisoning. A case of this kind came within the author's own experience (see Vomiting, p. 41). A similar one is quoted by Hensch from Krukenberg (*Unterleibs-Krank.*, ii. 205). Emplis, *De la Granulie*, p. 150, has recorded a case where epigastric pain and vomiting recurred in tubercular meningitis.

³ *Traité de l'Hystérie*, p. 251.

the peculiar mental state accompanying this condition serves in no small measure to intensify the gastric disturbance already existing, through the exclusive direction of the mind to the sensations experienced in the stomach, the influence of which, as pointed out by Dr. Carpenter, in describing the effects of "expectant attention" on the organic functions is by no means inconsiderable.¹

Among other causes operating probably on the general or local nervous centres through changes in the composition of blood, may be mentioned malarial conditions, which may impart to neuroses of the stomach a specifically intermitting character.² From the present state of our knowledge of the pathology of gout, it would almost follow that this affection should be placed in the same category, though the dyspeptic disturbances occurring in patients of this class may be referable to widely different causes, among which inflammatory conditions probably play no inconsiderable part.

With them also may be included, but with a certain degree of reservation, the effects of long-continued alcoholic poisoning, which, as Dr. Budd³ remarks, greatly resemble those produced by exhaustion.

Of the immediate exciting causes, sudden emotions, especially of a depressing kind, are among those most frequently cited as having given rise to these disorders; but a similar effect may be produced by moral affections of the same character acting through a longer period.⁴ The influence exerted by painful emotions not only in arresting digestion, but in producing painful sensations in the epigastric region, is well known, and these effects are greatly heightened in the case of patients whose nervous susceptibility is more than usually prominent.

As special conditions, acting locally, may be mentioned the abuse of stimulants and condiments, and in particular the habit of taking large quantities of tea and coffee.⁵

¹ See a case of this kind often quoted from Pinel, *Nosograph. Philosoph.*, iii. p. 612:—

"Le principe de tous mes maux, dit la malade, est dans mon ventre; il est tellement sensible qu'une peine, douleur, plaisir, en un mot toute espèce d'affection morale, ont la leur principe; un simple regard désobligeant me blesse dans cette partie si sensiblement que toute la machine en est ébranlée. Je pense par le ventre, si je puis en exprimer ainsi."

² Niemeyer, *loc. cit.* p. 546.

³ This is hardly, however, to be spoken of as a simple state, inasmuch as these cases are usually complicated by catarrh of the stomach, attributable, probably, to the immediate effects of the alcohol on the mucous membrane.

⁴ See cases by Barras, Briquet, Andral.

⁵ The latter agent is very commonly admitted to be an exceedingly frequent cause of gastrodynia, and of dyspepsia associated with much nervous disturbance.

Finally, in some cases the effects of idiosyncrasy must be considered. Some of these have been already alluded to, and reference may be made to two cases by Andral,¹ in one of which the use of milk always caused violent pain, while in another honey invariably gave rise to vomiting.

The causes capable of acting on the stomach, by reflex irritation conducted from other parts, have also been dwelt upon in previous sections, and it is only necessary therefore briefly to recapitulate them in this place.

They are, as has been seen, very numerous, and include sympathies with parts whose apparent connection with the stomach is very obscure, and some of which can only act, in all probability, through the general influence which *pain* exerts both on the appetite and on the digestive functions. Such are diseases of the external ear and of the teeth;² painful affections of the kidneys, testicles, and ovaries; disordered conditions of the lower portions of the alimentary canal, among which may be enumerated piles, worms, constipation, herniæ, including the omental and epiploic; diseases of the pancreas³ and of the liver, and especially gall-stones and abscess of the latter organ; and with a frequency far exceeding that of all those just enumerated must be mentioned diseases of the uterus, including tumours, polypi, ulcerations, prolapsus, retro- and anteversions, and yet more commonly disturbances of menstruation, leucorrhœa, and the state of pregnancy. With the exception of the last-named state—which is, however, far more frequently associated with disorders of the stomach in weakly than in strong and healthy patients—there are few of the uterine derangements here enumerated which are not more or less associated with an impairment of the general nutrition. The majority also appear to be more truly connected either as cause or effect with the primary disorder, than to arise through the disordered digestion, which is frequently the last in

See Clarus, "Arzneimittellehre," p. 666; also Wood, "Therapeutics and Pharmacology," i. 628. I have seen it stated, though I cannot find the original, that girls employed in needle-work, and in the Manchester factories, have not unfrequently a habit of chewing tea, with results evidencing a greatly disturbed condition of innervation both of the general system and of the stomach. The habit does not, however, appear common in London.

¹ Pathologie Interne, i. 153.

² See a case by Leiderer of a young lady in whom a false tooth fixed to the socket of a diseased one caused regularly returning attacks of pain and vomiting, which ceased immediately on removal of the pressure from the dental nerve. (Allg. Wiener Med. Zeit. No. 24, 1861.)

³ Claessen, quoted by Bamberger.

the series; while, with respect to frequency, though not perhaps to severity, leucorrhœa and disordered menstruation hold the foremost rank among this class of etiological conditions.

SYMPTOMS.—The class of symptoms by which nervous affections of the stomach are especially characterized have been already alluded to as consisting chiefly of pain, vomiting, and certain forms of hyper-secretion. These may, however, occur in every possible variety of combination with each other, and with other symptoms of indigestion, as well as in very varying degrees of severity. No special relationship can, as a rule, be traced between any of them and the different etiological circumstances under which they may occur; and causes apparently identical may, in different subjects, give rise to dissimilar symptoms; while, on the other hand, the most diverse perversions of function may occasionally be met with in cases whose mode of origin is to all appearance perfectly alike. Certain peculiar features do, however, mark some of the forms assumed by them, in connection either with particular states of the system or with special causes of nervous irritation; and in the description about to follow, the disorders that occur in the course of hysteria, chlorosis, amenorrhœa, hypochondriasis, exhaustion, gout, and certain uterine disturbances, will be more specially considered; those originating from other reflex conditions, or from organic diseases of the cerebral centres, being comparatively so rare and exceptional, that though their mode of causation is occasionally of diagnostic importance, they can hardly be included in a categorical description of the symptoms of the more usual forms.

The modes of invasion of these symptoms of nervous "erethism" may be either gradual or sudden, standing in this respect in an almost direct relationship to conditions similar in point of time or intensity of the exciting cause.

In the class of hysterical cases, *loss or depravation of appetite* is sometimes an early symptom, proceeding in many cases either to an absolute anorexia, which may even involve the nutrition of the patient in considerable danger;¹ or to some of the extraordinary perversions known under the names of *Pica* or *Boulimia*. Sometimes the last-named symptom becomes predominant, and the patients are affected with a ravenous and almost insatiable desire

¹ Briquet, p. 254.

for food, compelling them to eat at all hours of the day and night, and the origin of which in perverted sensation is evidenced by the feelings of sickness, pain, and faintness which ensue if the gratification of this desire is withheld.¹ "The psychical relations of the sense of hunger are altered; there is no appetite, and taking food affords no enjoyment."²

Severer symptoms, however, often speedily ensue, and among the most prominent of these is *pain*, which, however, varies greatly in duration and intensity. Commencing ordinarily with a sense of constriction or oppression, or sometimes with a feeling of distension or weight, it is followed by sensations of an agonizing character, which are variously described by the patients as consisting of heat, cold, tearing, gnawing, rending, or twisting. In the severer attacks the heart's action is interfered with, becoming fluttering and irregular; the extremities are cold, and there is a tendency to syncope: in some cases convulsions are said to have ensued from the severity of the pain (Schmidtman). Pain of this nature, though often aggravated by slight pressure upon the abdominal muscles ("épigastralgie" of Briquet), is usually relieved when it is made more firmly and persistently; and this is especially true of those forms that are associated with cramp or flatulence, but the conditions observed in this respect are somewhat uncertain.

The pain is sometimes associated with distension of the abdomen; at others this is sunk and retracted (Romberg). It is essentially paroxysmal in its character, returning sometimes at irregular, in other cases at regular periods on successive days in cases where the attacks are not attributable to malarious influences. In other cases,

¹ I have seen this state in a most intense form in an elderly single lady of between 70 and 80 years of age, who certainly has never exhibited any signs of hysteria. Every cause depressing her health is followed by a return of the symptom. The hunger distresses her chiefly at night, when she is obliged to eat several platesful of sandwiches. No other disease is present. She has been temporarily relieved by bromide of potassium, nitrate of silver, strychnia, and arsenic. The latter procured the longest period of immunity; but the symptom repeatedly returns whenever any impairment of health takes place. The condition, though generally occurring in the female sex, may sometimes be met with in males, as is shown by an extremely marked case recorded by Chomel, *Des Dyspepsies*, p. 24.

² Romberg, loc. cit. p. 107. Romberg remarks that this hyperæsthesia rarely occurs in an isolated or idiopathic form, and that it is found in a variety of morbid states—sometimes appearing as reflex or sympathetic, sometimes associated with other hyperæsthesia—and is observed during convalescence from severe diseases, in hysteria, helminthiasis, ergotism, or as the precursor of other diseases, and especially of gout.

it returns only at the menstrual periods, and there is comparative immunity in the intervals.¹

The duration of the attacks is variable. They may last only for a few minutes, or may continue for hours. They frequently terminate in gaseous eructation, or with the ejection of a watery fluid which may be acid, or alkaline (pyrosis), or of mucus of an alkaline character, and of variable degrees of tenacity; and they are commonly followed by a sense of soreness at the epigastrium, and by great exhaustion.

The relation of the effects of the ingestion of food to the pain is subject to some variation. There is one distinct class, before alluded to, where this gives relief;² and these cases form not only the larger number, but are those in which there is least suspicion of the accuracy of the diagnosis. This effect is certainly that most commonly met with in cases where the gastrodynia is associated with depressed vitality arising from exhaustion, or with nervous irritability dependent on moral or emotional causes. Another remarkable feature in these cases is, that insipid food and demulcents often cause much more pain than substances which are not only less digestible, but are even irritating in their character; and this peculiarity, which has been observed by numerous writers,³ is not without value in diagnosis. In other and rarer instances, which especially occur in aggravated forms of hysteria, and in some where the pain in the stomach is of reflex origin, and more particularly where it is due to uterine disturbance, the ingestion of food is immediately followed by severe pain, which is only relieved by

¹ Barras gives two cases where gastrodynia was associated with suppression of the menses; in one of these the pain was less violent when the discharge became more abundant. In this latter case there was also flatulence, and the pain was relieved by food. (Loc. cit. i. 587.) Niemeyer, loc. cit. p. 545, also gives a case of this character, where the pain only occurred at the menstrual period, but in which the application of leeches to the cervix uteri instantly caused its return. It must be remembered, however, that an increase in the severity of the pain at the period of menstruation has been observed in some cases of gastric ulcer.

² See Budd, loc. cit. pp. 282, 283.

³ "An uncommon delicacy of the nerves of the stomach, which may be either in a great measure natural or brought on by disease, . . . excessive grief, or other causes, is to be distinguished from that . . . increased sensibility, which is the consequence of an inflammation, or of an aphthous state of those parts, since in these last cases every acid substance gives them pain, whereas in the former many insipid and seemingly innocent substances produce great uneasiness in the stomach and bowels, while volatile spirits, strong wines, brandy, and spiceries, are not only inoffensive, but often necessary for allaying those disorders which are produced in the first passages by such causes as would scarcely produce any disturbance in the second state."—Whytt, loc. cit. p. 544. See also the same author, loc. cit. p. 566; see also Barras, loc. cit. i. 35, 414, 440.

vomiting; and though in some cases the appetite may be preserved, the fear of the agony caused by the food entering the stomach prevents the patient from eating.¹ In other instances, pain of this character is only felt some hours after food; but here the conditions are more complex, and pyrosis or great distension of the stomach from flatus is often present; in which latter case, though much of the pain felt may be due to the spasmodic contraction of its coats, some is also, in all probability, to be attributed to the cramp-like action of the abdominal muscles.

The state of the digestion sometimes affords a valuable criterion of the nervous origin of these affections; in many cases it is entirely unaffected in the intervals of the attacks,² while in others the ordinary symptoms of atonic dyspepsia are present. The tongue is, as a rule, clean, though often pale, broad, and flabby;³ the bowels are generally confined, but the feces are not otherwise altered. In cases, however, to be hereafter alluded to, when nervous excitability coexists with various degrees of inflammatory irritation of the stomach, these signs are lost. One remarkable feature with regard to these attacks is, that where any predisposition to them is present they may be brought on by painful moral emotions.⁴

Vomiting, though often attending the paroxysmal attacks last described, may also occur as an independent condition, unaccompanied by pain. This, though common in cases where it originates in reflex disturbances, or in certain disorders of the central nervous system, may also be observed in states characterized by simple perversion of function, and especially in hysteria. Its isolated appearance in the latter class, independently of other disturbances of sensation, is, however, the exception rather than the rule, though in some instances such pain belongs more to the class which Briquet has termed "épigastralgie," than truly referable to the stomach.⁵

¹ Briquet, p. 256. These cases are, however, those in which the accuracy of the diagnosis from ulcer must often be held in doubt, even when made by the most competent observer.

² This can only be said to be relatively true in regard to the diagnosis of these affections from those of an inflammatory nature. The same fact is often observed in the progress of cancer, and sometimes of ulcer, when associated with epigastric pain.

³ The varieties of appearances of the tongue described by Dr. Todd, loc. cit. p. 632, as indicating this state, viz. "a thin white gauze," "a milky appearance," or "a covering of frothy mucus," belong, I believe, to catarrhal conditions, but they are most common in patients of this class.

⁴ Whytt, loc. cit. p. 560.

⁵ See a case related by Briquet, loc. cit. p. 218, of a girl who, after severe moral emotion, was brought to the hospital with violent pain at the epigastrium, together with vomiting, which excited the suspicion of poisoning. The pain was relieved in ten minutes by faradization.

Nausea usually precedes to some degree the expulsive act; but its duration and intensity are shorter and less marked than in the vomiting which attends inflammatory or organic diseases of the stomach—approximating in this respect to the conditions observed in the vomiting from cerebral causes.

In some cases intervals of several hours, or even days, may elapse between the recurrences of this symptom, and during them the digestion may be good, or there may be (as in pregnancy) some degree of acidity, apparently from hypersecretion, after each meal; but in others, and apparently in proportion to the severity of the exciting cause, and also in pregnancy and hysteria, the vomiting tends to become continuous. Under such circumstances the food is rejected either as soon as taken, or within a few hours after eating, being often returned completely undigested, and rarely associated with bile or mucus (Briquet). Even when vomiting is severe, the appetite may in some hysterical cases continue, and may even present an apparent increase of intensity, so that the patient's time may be passed in alternate vomiting and eating;¹ but in other instances, when the disorder has commenced after moral depression, and when pain is also present, there may be a more or less absolute anorexia.²

In many cases of hysterical vomiting it has been a matter of repeated observation that the general nutrition and strength are but little affected; when, however, the vomiting is severe and constant, emaciation may rapidly ensue from the loss of food thus occasioned. The occasional dangerous effects of this symptom in pregnancy are well known, and have been already alluded to; and others of a similar character are detailed by Andral³ and Budd,⁴ where, although vomiting has continued long, the stomach was found healthy after death. In some of the cases of the latter class, though fever was absent in their earlier periods (thus conforming to the rule generally observed), it appeared, associated with delirium, towards their close, and in some instances assumed a distinctly hectic character.

The effects of varieties of food in promoting or retarding the

¹ Briquet, loc. cit. p. 255.

² Andral, loc. cit.

³ Clin. Med. ii. 175-179.

⁴ Loc. cit. p. 261. With regard to Andral's cases, however, the conclusions drawn from the apparently healthy state of the stomach should be received, in the author's opinion, with some caution, on the grounds stated in the chapter on the post-mortem appearances presented by the stomach.

occurrence of vomiting are almost as variable as are their relations to the symptom of pain. In the severer forms just alluded to, solids and meat have been known to increase both the pain and the vomiting (Budd); but when hysterical symptoms are well marked, indigestible and apparently unsuitable food may be tolerated when ordinary aliments are rejected as soon as taken.¹

There is another form of dyspepsia occurring under nervous influences, of which I have seen some examples, but which, as far as I am aware, has been fully described only by M. Trousseau.² It occurs both in males and females, under conditions usually preceded by some cause of exhaustion, especially affecting the nervous system; and my friend and colleague, Dr. Ringer, informs me that he has also observed it in children, and I have also met with it under five years of age. It is attended with an excessive appetite (boulimia), and by a sense of want following too speedily after food has been taken. The characteristic symptom is, however, that diarrhoea is present, and the evacuations, which are usually preceded by borborygmi and colicky pains, are induced with great facility by slight causes of an emotional character, and they contain considerable quantities of food which have passed undigested through the intestinal canal. Frequently an evacuation occurs immediately on rising in the morning, and is followed by a great sense of exhaustion; and I have observed in some cases that this can be delayed until the usual hour after breakfast, by simply taking a small quantity of food before rising. Trousseau ascribes these symptoms to an undue irritability of the muscular coat of the stomach and intestines, hurrying the food taken too rapidly through the whole canal, without permitting time for its due elaboration: and the influence of appropriate treatment strongly corroborates his opinion.

The affections of the general system frequently associated with the conditions which have now been described are nearly all such as point to their relation to a common cause. Many of them belong to the category of neuralgias, which occur either in distant or in

¹ See a case by Barras, loc. cit. i. 496, where the first food retained was a salad made with hard boiled eggs. A precisely similar one is recorded by Briquet, loc. cit. p. 307; another by Guipon, loc. cit. p. 349, where the acid vomiting of pregnancy was immediately arrested by the use of beer. Valleix, Bull. Thérap. Oct. 1849, has noticed that meat and champagne were retained when milk was rejected, and that a kind of food which was retained one day was vomited on the next, and vice versa.

² Clin. Médicale, ed. 1862, pp. 354, 365, 428, 429. This is probably also allied to the affection alluded to by Abercrombie, "Diseases of Stomach and Intestines," 3d edition, p. 71, and by Whytt, loc. cit. p. 530, as *quick digestion*.

proximate parts, and their appearance often alternates with remissions in the gastric disturbances. These often affect the dorsal, thoracic, abdominal, and intercostal muscles; but they may assume the forms of toothache,¹ hemicrania, lumbago,² or sciatica.³ Instead of pain, other symptoms of nervous excitability may be present, such as attacks of cardiac palpitation,⁴ or of strong pulsations of the abdominal aorta,⁵ which often occur both during and in the intervals between the attacks of abdominal pain, and are distinguished by their sudden invasion and cessation, and by their rapid exacerbations. Dyspnoea,⁶ globus, hiccough, paralytic,⁷ syncopal,⁸ or convulsive affections, salivation, and a copious discharge of pale urine⁹ have all been observed, with greater or less frequency, as concomitants of these affections of the stomach, and indicate very clearly the condition of perverted innervation from which its disorders arise, and which can be traced to the states of chlorosis, hysteria, melancholia,¹⁰ or hypochondriasis, in which they take their origin.

The sleep also is affected in the majority of cases, and particularly in hysterical patients, who not only experience a difficulty in going to sleep, but are liable to awake during the night, with a great sense of exhaustion and hunger. Insomnolence is also commonly observed in patients of both sexes in whom disorder of the stomach has been caused by anxiety or over-fatigue, though in them the feeling of hunger on waking is usually wanting. In other instances, however, of the latter class the sleep may be heavy, but it is often unrefreshing and disturbed by dreams.

Many of the disturbances of the functions of other organs of the body have been already spoken of in connection with the description of special symptoms, and it is unnecessary to again repeat the remarks made on the subject of the appetite, the digestion, or the

¹ Common in pregnancy.

² See a case of lumbago alternating with gastrodynia, Andral, Clin. Méd. II. 297.

³ Abercrombie, loc. cit. p. 86. Barras (i. 440) gives a case where a patient who had been subject to periodical headache became attacked with intermittent gastrodynia accompanied by the vomiting of mucus, but not of food, and which ceased on the supervention of sciatica. Two or three such attacks, with a similar order of sequence, were repeated at considerable intervals.

⁴ This, however, is a symptom common to all forms of dyspepsia.

⁵ Barras, loc. cit. p. 411. Walshe, Dis. of Heart, 3d ed. 438. Lebert, Virchow's Handbuch, V. ii. 53.

⁶ Whytt, loc. cit. p. 560.

⁷ A very interesting case of this nature, by Dr. Perceval, is to be found in the Med.-Chir. Trans. iv. p. 17.

⁸ Guipon, loc. cit. p. 118.

⁹ For a case of this kind occurring in a male patient, see Whytt, loc. cit. p. 557.

¹⁰ See Marshall Hall, On the Mimoses.

constipation and flatulence which, with some exceptions, mark these cases, nor on the irregular and scanty menstruation, or the leucorrhœa attendant on anæmia or chlorosis, whose influence has been already largely insisted upon. It has been observed that in many cases where hypochondriasis is most marked, oxaluria has been present. This symptom is, however, common to a great number of diseases, and in some cases it probably depends more or less directly either on an excess of animal food (Niemeyer)¹ or on imperfect assimilation, when its occurrence is rather to be associated with dyspeptic disturbances of another character, where the hypochondriasis, instead of being primary, is secondary to the disorder of the digestion, than with the more purely nervous disturbances now under consideration. In others, however, it appears to be directly associated with nervous disturbances of this class.

One important variety to which Whytt first called attention is that where severe disorder of the stomach occurs in connection with the gouty diathesis, and ceases with the appearance of the disease in one of the joints.² The attacks, however, as Whytt further remarked, are less liable to affect robust and strong individuals in whom the gouty affection is regularly developed, than in those of "weak fibres and very sensitive nerves," who have "rarely any disorder like true gout," but who are liable to "craving or faintness, nausea or vomiting, flatulent swellings, borborygmi, low spirits, cramps, convulsive and violent pains in the stomach and bowels, and an increased secretion of saliva." In other cases severe spasmodic affections of the stomach occur in the course of gouty attacks, and are characterized by violent abdominal pain, intense distension from flatus, and severe sinking, followed in some instances, when wine has been drunk, by acid vomiting, which has given relief.³ The nature of these disorders is, however, a matter of some doubt; and though evidence regarding them is still wanting, there is considerable probability that many of them are not simple neuroses, but are rather to be classed under the category of acute indigestions, complicated by a predominance of nervous excitability with prostration.

PROGNOSIS.—The course of these affections is, as may be inferred from their history, very variable. Their duration depends in a

¹ Loc. cit., t. 554.

² Works, pp. 556, 559.

³ See a case by Sir C. Sendamore, quoted by Dr. Garrod, "Gout," p. 503.

large measure on the persistence of the exciting cause, ceasing with its cure, as is often observed in cases originating in anæmia or chlorosis, or in those arising from reflected irritation, especially when the cause is seated in the uterus.¹ The rapidity of their disappearance on the supervention of some other nervous phenomena affecting other parts, or of an attack of gout in cases when this diathesis is present, has already been a subject of remark. Barras² has observed that in some cases they disappear on the supervention of acute diseases, as fevers,³ pneumonia, abscess, or variola, but are liable to reappear during or after convalescence.

The majority may continue for years with but little danger to life; and this is true not only of the minor degrees of hypochondriacal uneasiness, but even of some of the severer cases of hysterical pain and vomiting. The hysterical forms, like all the other phases of that malady, are liable to diminish in severity and even to disappear with advancing life.⁴

Briquet remarks that the vomiting of hysteria, though sometimes very obstinate, is the least dangerous of these affections. That it may, however, be attended with fatal consequences, and especially when constantly ensuing after everything eaten, and when associated with severe pain, is evident not only from his, but also from observations recorded by Andral, and Barras, and Budd. The danger resulting to the general nutrition from the more absolute forms of anorexia has been already remarked upon.⁵

The uncontrollable vomiting of pregnancy may also at times assume a very dangerous character. Thus, of fifty-eight cases collected by Cartaya,⁶ thirty were fatal, and twenty-eight were cured after abortion or death of the fœtus—fourteen of the latter having had premature delivery induced with success, while one recovered after the application of leeches to the os uteri, and two through the use of champagne.

¹ An interesting case of this kind is quoted by Henoeh, from the third edition of Romberg's work. Henoeh says that in some cases of cardialgia the pain has been known to occur only at the menstrual periods, to cease with pregnancy, and to return after delivery.

² Loc. cit., i. 539.

³ τὰ σπασμωδία καὶ τεταναδία ποτερὶς ἐπιγιγνόμεναι λίσσι. (Hippoc. Prænotiones, Works, Kühn's ed., i. 289.)

⁴ "Progrediente ætate cardialgia cerebro sponte evanescit; multas novi mulieres, quæ tempore juventutis et ætate florente frequentissime hoc malo macerabantur, ad senium perventas ab eo omnino immunes viventes." (Schmidtman, loc. cit., iii. 207.)

⁵ Of course this must not be confounded with those simulated forms of anorexia where the patients eat by stealth.

⁶ Schmidt's Jahrbucher, 1855, iv. 60.

THE PATHOLOGY of the functional disturbances of the stomach, of which the description has here been given, is involved in the obscurity which attends that of a large class of nervous affections, and of which, indeed, it may be said, that our knowledge consists rather of isolated facts than of comprehensive inductions. Many of the leading phenomena, attesting the influence of the nervous system in the production of the symptoms here alluded to, have been already considered, and the author has but little to add to what has been before stated, except to pass briefly in review some of the better known conditions of nervous disturbance which are applicable (in many cases, however, only inductively) to these affections.

It is well known that excessive excitability of the nervous system stands in an almost inverse relationship both to the due co-ordination and to the efficiency of the functions under its control, and that conditions of weakness or mal-nutrition of the nervous centres are evidenced by perversions in the harmony of their action characterized by an apparent excess of activity in one direction, but attended by deficiency in another.¹

Both the sensory nerves, and also those supplying both the voluntary and involuntary muscles (including among the latter the contractile coats of the bloodvessels), are subject to similar perversions of action. Thus it has often been noticed that when any part is the seat of severe pain, its power of distinguishing sensations is proportionably impaired, and local hyperæmia very frequently ensues. Hyperæsthesia is also occasionally combined with muscular paralysis or with convulsive movements, as may be sometimes observed in neuralgias of the fifth nerve.

The experiments of Lister and others have shown that the actions of the visceral and vaso-motor nerves are exalted by impressions of moderate intensity made on the nervous centres, but are paralyzed when these are carried to extreme degrees of stimulation. It is further highly probable that these impressions can be equally produced by peripheral stimulation of the sensory nerves as by direct excitation of the central roots of the motor fibres; and, therefore,

¹ Thus (to cite familiar instances) a muscle in violent convulsion is unable to execute voluntary movement; a weak eye is conscious to a morbid degree of the impression of light, while its power of distinguishing objects is diminished; mental excitement, attended with rapid thought and vivid imagination, is generally deficient either in perspicuity of ideas or in the power of sustained attention or of logical precision.

the reflex effect resulting from the former will depend not only on the sensibility of the peripheral branches, but also on the degree of excitability of the nervous centres. Hence, when this excitability is excessive, the effects of a moderate peripheral stimulus will resemble those produced artificially by excessive direct stimulation in the healthy state, and will give rise to paralysis or convulsion according to the proportion borne between the amount of stimulus and of the excitability present. Dr. Handfield Jones¹ has also adduced some reasons for believing that vaso-motor paralysis, determining excessive secretion, may coexist with undue irritability of other nervous branches, since excessive secretion from the eye and nose are known to be frequently attended with hyperæsthesia of the sensory nerve of these parts. If this view be correct, it is comparatively easy on the data above given to frame an hypothesis, with relation to these affections of the stomach, explanatory of the phenomena of hyperæsthesia associated with secretions either excessive in amount or perverted in quality, and also with spasmodic movements indicated by vomiting, and occurring in conditions signalized by morbid excitability of the nervous centres. The cases also in which reflected nervous action is observed to proceed in unusual, and probably in abnormal directions, appear to be explicable by the same data, and are further illustrated by some striking examples of such occurrences in parts more directly accessible to observation.²

The effects of anæmia as a cause of local pain, to which some allusion has been made by recent writers, and especially by Dr. Anstie, may possibly serve in some cases to explain the sensation of pain felt when the stomach is empty, and also its relief by food, which causes an increased afflux of blood to the part; and it is not without its parallel in the neuralgias of other parts, which are cured by a blister placed on the course of the nerve, or directly on the seat of pain.³

Of any special anatomical conditions discoverable in these cases we are as yet in ignorance; in fact, the absence of these constitutes their distinguishing feature, as contrasted with those cases where

¹ Functional Nervous Disorders.

² See an interesting case cited by Dr. H. Jones, "Functional Nervous Disorders," p. 11, of paralysis of the muscles of the eye, attended with circumorbital pain, resulting from necrosis of one of the phalangeal bones of the hand.

³ Anstie, Stimulants and Narcotics, p. 214.

such lesions are found to explain the phenomena observed during life.

The question regarding the possibility of organic disease resulting as a consequence from long-continued disturbances of function, excited through the nervous system, is of very considerable importance, but distinct clinical evidence of any anatomical lesion of the *stomach* having originated independently from this cause is very defective, and the general question is of too wide an extent to permit of its appropriate discussion in this place.

DIAGNOSIS.—The diagnosis of the several forms of nervous disturbance from those arising from the organic diseases, the symptoms of which they more especially simulate, is often a matter of extreme difficulty.

(a) The chief criteria upon which reliance must be placed, are the recognition of a constitutional state predisposing to nervous excitability, and particularly the presence of conditions of great exhaustion or the hysterical diathesis.

(b) The presence of causes of sympathetic irritation, and the aggravation or alleviation of symptoms of the stomach affection in a direct ratio with an increase or diminution of the severity of these.

(c) The disproportion observed between the severity of the gastric symptoms and the general state of the patient, and particularly the absence of emaciation when severe vomiting forms a prominent feature. The evidence from cachexia is of less value, since anæmia is frequently associated with nervous disturbance; and chlorotic females, whose menstruation is disordered, are frequently the subjects of ulceration of the stomach.

(d) In the case of pain, its frequent complete remissions are almost diagnostic of the absence of inflammation, though by no means excluding the possibility of its cause being due to either ulcer or cancer. Pain from inflammatory affections, unless due to corrosive poisons, seldom, however, presents the intensity of suffering produced by neuralgias of the stomach. The seat of the pain, and especially of tenderness, requires careful investigation; and when this is exclusively superficial,¹ it would strongly favor the

¹ I have known, in some cases where, from the presence of hæmatemesis and severe pain occurring immediately after food, there was the strongest suspicion of the existence of ulceration, there was yet great superficial tenderness. Careful

opinion of the nervous character of the disorder, even when under these circumstances it is allied with vomiting.¹

(e) Pain occurring when the stomach is empty, and relieved by food,² is almost distinctive of its nervous origin. Exceptional cases of this nature have indeed been observed in ulcer and cancer, but they are of great rarity. The influence of the nature of the food upon the pain, and also upon vomiting, is another criterion, which is not without value. It has, however, been occasionally noticed in exceptional cases of ulcer, that stimulants have given relief.

(f) The coexistence of other neuralgia, and the alternation of pain with these, are also a strong ground for suspicion that the affection of the stomach belongs to the same class. Intercostal neuralgia is, however, of minor value as a means of distinction, as it may be observed in some cases of ulceration. Dorsal pain is common in both classes, and affords but few positive features of distinction between them. Spinal tenderness, though commonly present in cases of neuralgia, is occasionally absent, while, on the other hand, it may exist in cases of ulceration. The presence of other neuroses is also a valuable aid, though it must be remembered that in some females excessive sensibility may coexist with an inflammatory condition of mucous-membrane, and that in such cases the recognition of the latter is of great importance in relation to treatment.

(g) Vomiting from nervous disturbance often resembles that arising from cerebral causes in the facility with which the act takes place, and particularly in the absence of relief to the pain or nausea which attends the evacuation of matter irritating a stomach which is the subject of organic disease. The coexistence of pyrosis with pain affords but little conclusive evidence as to its origin, since this symptom may arise from causes both of organic and of purely functional nature, the character of which must be determined by the attendant symptoms.

(h) The absence of pyrexia usually distinguishes these affections from those of inflammatory origin, though it is of no value in their diagnosis from ulcer and cancer, in which disorders a febrile state

examination, however, revealed the existence of tenderness on deeper pressure in limited portions of the epigastric region.

¹ See Briquet's cases, before quoted.

² A craving for food is sometimes experienced in cases of chronic catarrh, and also of ulcer; but when yielded to, it usually aggravates the uneasiness. There are, however, exceptional cases of an hysterical character, before alluded to, where, though a strong desire for food exists, it is speedily followed by vomiting.

is very seldom observed except from the presence of some other inflammation capable of exciting it.

(i) The state of the tongue usually serves as an additional guide in the diagnosis from inflammatory affections. It is usually unaffected when the disturbance is of nervous origin; its characters in the catarrhal states have been already described.

On the other hand, the tongue is of little value in the distinction of the neuroses of the stomach from ulcer and cancer, where the appearances which it may present are very uncertain, and depend more on the presence or absence of the complication of catarrhal states than any other cause.

(k) The diagnosis of severe attacks of spasm in gouty cases from those of inflammatory origin is one of considerable obscurity, as the intense depression often masks to some degree the inflammatory symptoms. The chief symptoms which should create suspicion are febrile disturbance, a loaded tongue, tenderness on pressure at the epigastric region, and burning or heat at the stomach, as distinguished from the cramp-like pain which usually marks the attacks of a more spasmodic form.

THE TREATMENT of the various forms of nervous disturbance of the stomach may be briefly summarized as consisting in modifications of the tonic and stimulant plan already recommended for atonic dyspepsia; and their cure under this system affords further and valuable evidence of their true nature.

The discovery and cure of any source of peripheric irritation from which the symptoms may originate is of the very first importance. It does not, however, seem necessary to do more than remind the reader of the frequency with which in the female sex these diseases have their starting-point in uterine disorders. It will, however, conduce somewhat to perspicacity if the remedies which may be more particularly directed to the condition of the stomach are mentioned in relation to the symptoms for which they have been found most efficacious.

In the relief of neuralgic pain iron holds a prominent place.¹ In the majority of instances the neutral preparations, and especially the carbonate, are both the most serviceable and also the safest. The dose should not exceed five grains, since larger ones often

¹ See especially Andral, Clin. Med., ii. 223, and Dr. Martin's case, before alluded to.

provoke colic and intestinal disturbance (Trousseau). Some writers, however, as Abercrombie, Dr. Handfield Jones, and Henoch, recommend the sulphate in doses of one to two grains. Henoch advises that it should be used in combination with morphia, and Abercrombie with aloes and pulv. aromat. taken twice daily, and the latter formula will at times be found serviceable when constipation is present.

Arsenic has been found very useful by Dr. Leared¹ in cases of severe neuralgic pains when there are no signs of irritability of the stomach as evidenced by redness of the tongue, and pain following immediately after the ingestion of food. When this symptom has however appeared in phthisis, Dr. Leared has also found arsenic useful. The cases where it is most indicated are those when the neuralgic condition has followed mental or physical exhaustion, and in those of malarial origin.

Nux vomica is very useful in these cases, as also in some forms of pyrosis.

Bismuth and the nitrate and oxide of silver are also valuable. Hydrocyanic acid has appeared to the author of inferior efficacy in relieving either pain or vomiting of nervous origin.

The utility of opium in painful affections of the stomach can scarcely be overrated, though the usual caution is necessary with respect to its habitual use. A single dose will often permanently relieve pain of many days' standing, and its value has been strongly insisted upon by most writers on these disorders.

It is of special use in gastrodynia arising from anxiety and exhaustion, but its value is not inconsiderable in many hysterical cases; and it has been remarked that, when it agrees, its effects in producing constipation are scarcely perceptible.

In pyrosis, bismuth combined with opium seldom fails to relieve; though, in order to complete a cure, a more direct astringent is sometimes necessary, and for this purpose the compound kino powder is the best remedy that can be employed. Pain from flatulence is in these cases best treated by ether, or by aromatic spirit of ammonia, and the former agent is sometimes useful in checking hysterical vomiting. Trousseau² speaks highly of the use of valerian and assafoetida in the wearing uneasiness which he terms "*anxiété épigastrique*."

¹ Brit. Med. Journ. 1867, vol. ii.

² Traité de Thérap., ii. 307.

In the general irritability of the nervous system, associated with dyspeptic symptoms and oxaluria, which occur among the effects of anxiety or exhaustion, the sulphate of zinc, first recommended by Dr. Golding Bird,¹ and the oxide, subsequently used by Dr. Marcet² in cases where the same symptoms have followed the use of alcohol, and even in some where the latter cause has not existed, often prove of considerable service. They both seem to act as "tonics" in this condition, and the oxide has the additional advantage, if given at bedtime in doses of from two to three grains, of procuring sleep.

When the pain is very severe, relief has sometimes been experienced from the application of plasters of belladonna or of opium to the epigastrium, or from counter-irritation in this region by means of croton oil or blisters, and the latter may be followed by the endermic application of morphia.³

In obstinate cases it may be well to try Briquet's recommendation of faradization.

Vomiting is sometimes a very difficult symptom to overcome, and the possibility of its fatal termination has been already alluded to. When very severe it is important to give the stomach rest by the employment, during a certain period, of nutritive enemata, a plan which should never be omitted when vomiting, from whatever cause, is severe and obstinate. The value of rest is further illustrated by a case quoted by Sir T. Watson and other writers from William Hunter,⁴ where a boy, reduced to an extreme degree of emaciation by constant vomiting, attended by severe pain, was fed by spoonfuls only of milk frequently repeated, with the effect of completely arresting the vomiting, and enabling the stomach to bear more substantial food, the result being that the patient was completely cured; and numerous cases since recorded have confirmed the advantages of this method.

Opium is often of considerable value, and I have known a few doses of three or four drops of laudanum speedily check vomiting

¹ Loc. cit., p. 256.

² Chronic Alcoholic Intoxication, p. 100.

³ It is probable that in many of the cases where the efficacy of such remedies has been recorded, the pain so relieved has more truly been seated in the abdominal muscles, where, as before remarked, its presence may complicate the gastric pain. In some of these cases the hypodermic injection of one-sixth of a grain of morphia over the seat of tenderness has afforded relief, and I have known this plan to be most efficacious in the severe pain associated with a cancer of the stomach which had formed adhesions to the anterior abdominal wall.

⁴ Med. Obs. and Enquiries, vol. v.

resulting from disease of the uterus, which had persisted for some weeks previously. It may be given an hour before meals, and in severe cases its administration by enemata may often be resorted to with advantage.

Iced effervescent drinks, combining the effects of cold with the sedative¹ effects of the carbonic acid, also prove useful; and benefit is sometimes experienced from the use of champagne, and also from effervescent draughts containing hydrocyanic acid.

Bismuth, as has been remarked by other writers, is of comparatively little service when vomiting is purely sympathetic, and particularly when it arises from disorder of the uterus; but when any inflammatory state is present and complicates the nervous disturbance, it may often be employed with advantage combined with hydrocyanic acid.

The oxalate of cerium (first introduced into practice by Sir J. Simpson,² of Edinburgh) has been found very efficacious in some cases of vomiting in pregnancy. It should be given in pills in doses of one or two grains.

In many of the milder cases of acid vomiting or troublesome heartburn of pregnancy, hydrochloric acid combined with tincture of *nux vomica*, given before meals, often proves of service. I have seen less benefit result from the use of the acid alone; and part of the efficaciousness of the remedy is in my opinion due to the influence of the *nux vomica*.

Pepsine is also occasionally of value in these affections, though the mode of its operation is not very intelligible; but the administration of one or two doses is sometimes sufficient to enable the food to be retained, and the habit of rejecting it, being once broken, seems in some cases to be the essential feature of the cure.³

Among other remedies that have been found efficacious in hysterical vomiting are the douche, shower-bath, or cold affusion to the body and abdomen.⁴

In the vomiting of pregnancy, Bretonneau reports that he has found great service from frictions of belladonna over the hypo-

¹ Pereira, *Mat. Med.*, i. 125; Sir J. Simpson's *Obstetric Works*, ii. 769.

² Sir J. Simpson's *Obstetric Works*, i. 313.

³ This point has been ably insisted upon by Mr. Chambers.

⁴ Andral, *Clin. Méd.*, ii. 196. Barras, i. 489, quotes a case from L. Frank, where a lady who had vomited her food for eight years, retained it when taken in a bath.

gastric region;¹ and the application of the extract to the cervix uteri has been made with the same intention by Cayeaux² with good effect.

Acupuncture has also in some cases been efficacious,³ and in others faradization⁴ has been found of value.

The internal administration of tincture of iodine has been known to check the vomiting of pregnancy,⁵ but it does not appear to have been tried in this country, and I have no experience of its efficacy.

Finally, it must be recollected that troublesome vomiting apparently of the same kind may sometimes be caused by constipation, and that the use of aperients may be absolutely necessary to overcome it. In these cases the mixture of carbonate and sulphate of magnesia in doses of a scruple of the former to two drachms of the latter in some aromatic infusion, should be administered repeatedly every four or six hours, or castor oil may be taken on several successive mornings until the bowels have acted freely.

The foregoing list, though affording a great variety of choice, indicates also that there are probably concealed differences in the nature of the affections for which they are found useful, which are not as yet fully elucidated. The more ordinary kinds of neuralgic pain, when independent of causes of reflex origin, are, as a rule, easily controlled by iron, nux vomica, opium, ether, nitrate or oxide of silver, hydrocyanic acid, bismuth, or arsenic; but it is in the cases of severe hysterical pain and vomiting, or where these symptoms originate from causes of irritation in distant organs, that the greatest difficulty is experienced, and in these there is a considerable degree of uncertainty in the effects of treatment.

In the nervous disorder of the digestion which has been described as associated with diarrhoea, opium before meals, or administered in a clyster at bedtime, often affords relief; but I have known cases in which the health was only finally re-established after the use of nux vomica and hydrochloric acid. Patients suffering in this manner should avoid hot fluids at meals, and abstain from tea in the evening. In fact, in most of the nervous affections which have been here described, the use of tea and coffee, and

¹ Trousseau and Pidoux, *Traité de Thérap.*, ii. 76.

² *Ibid.*

³ *Ibid.*, i. 190.

⁴ Briquet, before quoted, p. 218; Brichesteau, *Bull. Gén. Thérap.*, lxi. 417; Debout, *Bull. Thérap.*, Aug. 30, 1863.

⁵ Clarus, p. 840.

especially of the latter, is injurious, and often serves to excite pain even after it has been allayed by treatment.

The majority of cases of spasmodic pain supervening in the course of gouty attacks are to be treated with large draughts of warm water, and with ether, musk, or camphor. The sense of distension and load at the stomach, and the relief often experienced from vomiting, are not, however, to be taken as indications for the administration of stimulant emetics; for in such cases inflammation of the stomach, if not already present in some degree, is very liable to be excited by any undue irritation of the mucous membrane. It is desirable in all cases to promote by hot pediluvia or by mustard cataplasms the return of the disorder to the feet, and cases are recorded where this has been followed by immediate relief to the stomach symptoms.¹

III.

GASTRITIS.—ACUTE GASTRIC CATARRH.

SYNONYMS.—*Catarrhe de l'Estomac* (Pinel); *Gastritis Erythematica*; *Erysipelas Stomachi*; *Ventriculi Inflammatio* (Boerhaave); *Febris Stomachi Inflammatoria* (Hoffmann); *Febris Mucosa* (Typhoid?); *Inflammatory Dyspepsia* (Todd); *Gastrite*, *Embarras Gastrique*—French; *Magenentzündung*, *Magen-Catarrh*—German.

VARIETIES.—*Gastritis Erythematica*, G. Phlegmonodea: *Cullen*. Erythematous Gastritis, Gastritis with Alteration of Tissue, Follicular Gastritis, Gastritis with Alteration of Secretion: *Billard*. Gastrite Primitive, Gastrite Secondaire: *Valleix*. Phlegmonous, Catarrhal, Rheumatic Gastritis: *Hildenbrand*. Catarrhal, Croupous, and Diphtheritic; Inflammation of Lenticular Glands; Inflammation of Submucous Tissue: *Rokitanski*.

DEFINITION.—An acute disorder of the stomach characterized by depression and prostration, with or without pyrexia, by anorexia, nausea, vomiting, and in severe cases by pain after food, and depending on an inflammatory condition of the mucous membrane.

¹ See Dr. Copland's Med. Dict., vol. ii. p. 39; also Dr. Garrod, before quoted.

The terminology and real nature of this affection have been involved in much obscurity from the variety of the affections con-founded under this title, including the specific fevers on the one hand, and on the other, post-mortem softenings, ulcer, and cancer of the stomach.

There is no question but that acute typical gastritis, unless when caused by acrid poisons, is a comparatively rare affection, and equally so is the disease corresponding to Cullen's *G. phlegmonodea*, when suppurative action takes place in the submucous tissue. Its milder forms, corresponding to the catarrhal affections of other mucous membranes, are, however, exceedingly common, and constitute the cause of the majority of the acute attacks of indigestion which occur either spontaneously or in the course of other diseases. The distinction, however, between the acute and chronic stages of inflammatory affections of the stomach is not always capable of being drawn with great accuracy, since, as remarked by Chomel, many persons liable to the disease may often suffer from a succession of subacute attacks, which, being excited by slight causes, may imperceptibly pass into one another, and thus acquire the character of a continuous disorder.

ETIOLOGY.—This disease is common at all ages, and in both sexes. It is said to have been observed in the fetus.¹ In infancy² also, and at the periods of dentition, it is easily excited by food unsuited to the digestive powers of the stomach or not properly prepared by suitable mastication; and in advanced life the latter cause, together with the enfeebled nutrition of the organ, render it liable to be affected by similar influences.³

¹ Andral, *Path. Interne*, i. 17; Rayer, *Diet. de Méd.*, x. 134.

² It is important that the junior practitioner should remember, what is seldom mentioned in systematic treatises, that certain causes may affect the milk given to infants, through which it often proves a source of severe gastro-enteric catarrh. Menstruation occurring during lactation is one of these; and in infants brought up by hand on cow's milk, vomiting and purging are frequently excited when the animals are fed on turnips or mangold.

³ These remarks apply to the acuter forms alone. The only two authors, Dr. H. Jones (*Dis. of Stomach*, p. 74) and Willigk (*Prag. Viertel-Jahresch.* li. p. 28) who have made observations on this head, have included both recent and chronic catarrh in their statistics; and in these taken collectively, the tendency to increased frequency of occurrence with advancing age is very striking. Willigk's observations, however, only begin with ages from thirty upwards; and of twenty-three cases, by Dr. H. Jones, "eleven were past fifty years, and fifteen past forty years of life." I believe, from my own observations, that the increased frequency of gastric catarrh in the later periods of life will be found rather to affect the chronic than the acuter forms.

Weakened states of the general system or of the stomach, which diminish the secretion of the gastric juice, are also frequent causes of inflammatory irritation, owing to the food introduced not undergoing its normal changes, and thus acting as a source of inflammatory irritation. Hence, among its predisposing causes must be enumerated many of those giving rise to general atony, and especially the presence of chronic exhausting diseases, or the period of convalescence from acute disorders.

A similar influence has been attributed to the effects of inanition or starvation, owing to observations of Hunter¹ and Blundell,² where the stomach in such conditions has been found softened after death. Andral³ also met with ulcerations, and other writers⁴ have mentioned that nausea and vomiting have been observed under these circumstances. Such a result is, however, by no means constant;⁵ and though it is possible that inflammation may in some cases be caused by the participation of the stomach in the mal-nutrition which occurs in all the tissues under such circumstances, as well as by the arrest of its normal physiological functions, yet it is more probable that in most cases it is due to the effect of food imperfectly digested after periods of prolonged abstinence.⁶

As exciting causes must be mentioned irritants of all kinds, including those whose action is purely mechanical, but especially the mineral and vegetable acrid poisons, and particularly arsenic,⁷

¹ Phil. Trans. 1772, "Observations on certain Parts of the Animal Economy."

² Quoted by Dr. Hodgkin, "Morbidity Anatomy of the Mucous and Serous Membranes," ii. 309.

³ Path. Interne, i. 15; *Essai d'Hématologie Pathologique*, p. 82.

⁴ See especially a letter from Mr. Malcolmson to Lord Hardinge, on the effects of a diet of bread and water on prisoners in causing total loss of appetite, consumption, or diarrhoea with slimy discharges, together with fever, a swollen red tongue, and great prostration. Quoted by Budd, loc. cit., p. 96, who gives other cases.

⁵ See Chossat, *Rech. exp. sur l'Inanition*; Barras, loc. cit., p. 522; also Taylor's "Medical Jurisprudence."

⁶ Chossat found that pigeons in a state of starvation could not digest the food given them, and that under these circumstances they suffered from diarrhoea; and other illustrations of the same fact occur in the histories of persons who have suffered from starvation. Barras (ii. 168) says that after the season of Lent many persons suffer from indigestion. Two facts, observed by Bidder and Schmidt, deserve to be borne in mind in relation to this question, viz., that after a moderate period of fasting the secretion of the gastric juice is increased, but that after longer abstinence it is diminished.

⁷ The use of arsenical paper-hangings has also caused the same condition, an instance of which has come under my knowledge, where a previously healthy child was seized with violent vomiting, in which blood was brought up, while sleeping in a room so papered. Dr. King Chambers has narrated a similar case—"Indigestions," p. 217.

and tartar emetic,¹ mustard, and ipecacuanha when administered as emetics.

In the same category are to be placed substances of an unsuitable character taken as food, such as decomposing meat or vegetables, or shell-fish in some special conditions—which latter seem to have a peculiar efficacy in this direction. The same effect may, however, be due to alimentary substances which are not directly injurious, taken in excess of the digestive powers of the gastric juice, though their influence in this respect must to some degree depend upon their relative digestibility. Similar consequences may ensue from causes operating through the nervous system suddenly arresting the process of digestion, and thus reducing the food which has been taken to the position of a foreign body, and consequently an irritant to the stomach.

Drinking largely of cold water when the body has been heated is also mentioned as a cause of catarrh of the stomach. Sudden changes of temperature have had a similar influence attributed to them;² and climatic conditions appear sometimes to act in the same direction, for catarrhal affections of the stomach are most common in changeable weather, with cold and high winds, as in the spring and later autumn,³ and also during the severe heats of summer and early autumn.

There appears to be a certain amount of evidence to show that epidemic influences have some share in producing this disorder. Thus Sydenham describes, in the years 1669-70-71-72, as coincident with dysentery, and following an epidemic of "cholera," a fever setting in with gripes, headache, a moist tongue with a thick fur and aphthæ, *cured in six days by purging and low diet.*⁴ Barras⁵

¹ Andral, Clin. Méd., i. 246.

² Guipon (Traité de la Dyspepsie, Obs. 21, p. 329) has recorded a case of a workman who, after exposure to the heat of a furnace, was seized with acute vomiting and pain at the stomach, and this accident was repeated several times.

³ Broussais (Hist. des Phleg., ii. 456, ed. 1822) says that inflammatory affections of the gastro-intestinal mucous membrane were very common in the Venetian Friuli, but many of his cases can hardly be considered as examples of simple gastritis, and would now be considered as pneumonia, typhoid fever, or acute tuberculosis. Brighton has universally the reputation of making many "bilious" during early periods of their residence there; and Dr. J. Todd (Cyc. Pract. Med., art. "Indigestion") says that these disorders are common in Turkey, Greece, Italy, Spain, Nice, Genoa, and Marseilles; and that they often follow the *bise* in Switzerland, the *mistral* in Provence, and the *tramontana* in Italy. Willigk (Prager Viertel-Jahreschrift, li. p. 28) gives for 327 cases of acute and chronic catarrh combined, observed in five years, the following relative proportions between the number of cases occurring in the different seasons: Spring, 6.2; summer, 3.4; autumn, 2.9; winter, 2.5.

⁴ Syd. Soc. Trans., i. 177, 181.

⁵ Loc. cit., ii. 161, 162.

remarked, that during the cholera epidemic of 1832 affections of the stomach were very common. P. Frank¹ ascribed them to a *constitutio annua*, and Schmidtman² to a *constitutio gastrica*, independent of any special kind of weather. Chomel has remarked the coincidence with cholera of the cases of vomiting which he terms "*dyspepsie acide grave*." During the height of the epidemic in August, 1866, I was much struck with the frequency of subacute inflammatory affections, corresponding in their symptoms to the state known by the French as "*embarras gastrique*;"³ and Barthez and Rilliet⁴ consider the probability of this affection and of other forms of gastro-intestinal catarrh taking place under epidemic influences as very strong. It has also been stated that there is a special proclivity to gastro-intestinal catarrh during some epidemics of typhoid fever.⁵

There are several other diseases with which inflammatory conditions of the stomach so frequently concur, that they may almost be considered as part of the general disorder. Many belong to the acute febrile affections; and although the impairment of the functions of the stomach in them is not always due to changes of an inflammatory character—nor is it easy to explain why these should be prominent in some cases and absent in others—yet the influence of some is so well marked, that they deserve to be mentioned as almost constant exciting causes of gastric disorder. Among these may be mentioned cholera⁶ and scarlatina,⁷ erysipelas⁸ and measles;⁹ and I have observed the same conditions in diph-

¹ De Curandis Hominum Morbis, i. 73-75.

² Summa Obs. Med., iii. 300. There is no doubt that some of the epidemics spoken of by older writers, as by Elsaesser, Sarcom, Roederer, and Wagler ("*De Morbo Mucoso*"), P. Frank and Reil, included cases of typhoid fever, "or of typhus complicated with dysentery" (Murchison). See J. Frank, *Prax. Med. Univ. Præcept.* 1811, vol. i. pars i. p. 244; also an analysis of this subject by Dr. Murchison, "*Treatise on Continued Fevers*," p. 393.

³ See also the report in the Medical Times and Gazette, July, 1866, of the frequency of "*embarras gastrique*" during the outbreak of cholera at Amiens. A similar frequency of this complaint reappeared during the autumn of 1871, at least in my private practice. I have not seen signs of gastric catarrh so common since 1866. Cholera has been prevalent in Europe, though not in England.

⁴ *Traité des Malad. des Enfants*, i. 717, 732, 739, etc.

⁵ Schmidt's *Jahrbücher*, 1863, pp. 123, 243. Bericht über die Krankenhäuser Wieden.

⁶ Several observations on the effects of cholera in causing acute gastritis are also to be found in Andral, *Clin. Méd.*, ii.

⁷ Brinton, *Diseases of Stomach*, p. 57.

⁸ Bamberger, P. Frank, Fenwick, *Med.-Chir. Trans.*, xvii.

⁹ Barthez and Rilliet (*Malad. des Enfants*, iii. 271).

theria,¹ variola,² puerperal fever,³ phlebitis, pneumonia,⁴ and pyæmia, and, with a less frequency, in typhoid fever. It is also a common complication of pulmonary tuberculosis, this condition having been met with in 28 per cent. of a series of cases of acute and chronic catarrh tabulated.⁵

Inflammation of the stomach has also been observed to follow the retrocession of gout and of acute rheumatism.⁶

It may also be considered a question deserving further elucidation, whether some of the cases of vomiting in pregnancy, hitherto set down to reflex irritation, may not depend on alterations of a similar kind.⁷

The liability of the stomach to suffer from other causes inducing constitutional irritation and febrile action is illustrated by Abernethy's observations,⁸ who was well acquainted with this effect of general disturbance of the system.

The question of the possibility of nervous disturbance chiefly arising from moral emotions, acting as exciting causes of the dis-

¹ Sir W. Jenner has also seen diphtheria of the fauces associated with false membranes in the stomach ("Diphtheria," 1861, p. 4). This does not appear to be common, and, from Sir W. Jenner's observations, it is probable that its occurrence is somewhat influenced by epidemic character. (See also Squire, art. "Diphtheria," Reynolds' Syst. Med., vol. i. p. 401.)

² See also Andral, *Proc. Path. Anat.*, ii. 226.

³ In a series of observations where my attention was specially directed to this point, I observed catarrhal affections of the stomach in only four out of nine cases of this disease.

⁴ Originally observed by Dr. Stokes, *Cyc. Pract. Med.*, iii. art. "Gastritis."

⁵ See chapter on Chronic Catarrh.

⁶ The former has not been proved by post-mortem evidence. Of the latter a fatal case is recorded by Andral, *Clin. Méd.*, ii. p. 11. I have observed a case where the retrocession of the pains from the joints was followed by vomiting and diarrhoea, and a similar one is recorded by Chomel, *Des Dyspepsies*, p. 137. I have also observed in three cases in private practice intense gastric catarrh precede, in two cases by many days, and in one for many weeks, an attack of acute rheumatism.

⁷ The majority of cases where examinations after death from this cause have been recorded speak of the stomach as showing little or no signs of disease. Virchow, however (*Ges. Abhand.* 778), has shown that in pregnancy the liver sometimes shows the same alterations as have been commonly noticed in the kidney, and which, under the title "Cloudy Swelling," are recognized as indicative of an inflammatory condition. This state will be described in the account to be given of the pathological changes found in catarrhal inflammation of the stomach, as frequently forming the most characteristic appearance present. In the *Dict. des Sciences Méd.*, vol. xvii. p. 382, art. "Gastrite," is recorded, by Guersant, a case of a woman dying from vomiting in pregnancy, in whom the stomach was found "*très-blanche, un peu plus épaissie que dans l'état naturel, et recouverte d'une mucoité abondante.*"

⁸ Rayer (*Dict. de Méd.*, x. 136) says that he has observed that inflammations of the joints, the kidneys, bladder, and serous membranes had an important influence in determining gastro-enteric inflammation, which was acute or chronic according to the severity and duration of its cause.

ease, has been already alluded to. There are, however, as has been before remarked, but few authentic or uncomplicated instances of this nature recorded. That they may act as indirect causes by arresting digestion, is very probable; but further proof appears to be required before their direct influence can be regarded as fully established.¹

THE SYMPTOMS of recent or acute catarrhal affections vary considerably in intensity according to the degree of severity of the attack. They may be generally comprehended under the following category: Uneasiness, distress or pain at the epigastrium—the latter symptom being however occasionally wanting, or not present to any marked degree, even in some of the severer forms of the disease; anorexia more or less complete, vomiting, thirst, general malaise or prostration, headache, febrile reaction of variable intensity, thirst; constipation in some cases, diarrhoea in others. Beaumont's observations have shown that in slighter cases of this nature local uneasiness may be completely absent, and the disorder of the stomach may only be revealed by general malaise accompanied with slight headache. There are also differences observable in the character of the attacks, and the disorder may be described as existing in certain typical forms, between which, however, every shade of variety or resemblance may in different cases be found to exist. The principal of these are:—

(a) Acute indigestion and the "embarras gastrique" of the French authors.²

(b) Febrile forms in which the fever is secondary to the disorder of the stomach.

(c) Acute catarrh in infants.

(d) Severe inflammation resulting from irritant poisons.

(e) Catarrhal affections of the stomach, complicating the exanthemata and other acute diseases.

(f) Acute catarrh of the stomach arising from alcoholic excess.

(g) Gouty inflammatory affections of the stomach.

¹ With the exception of the case previously quoted from Andral, the recorded observations of this nature are chiefly in older writers. (Hoffmann, *De Inflamm. Ventris Frequentiss.* Op. vol. vi. 223-227; Blasius, *Obs. Med. Anat. Rariores*; Barry, *Acta Reg. Soc. Med. Hannover.*, vol. iii., all cited in Copland's Dictionary.)

² Many of these authors consider "embarras gastrique" as a distinct disorder, having nothing in common with the inflammatory processes. I cannot but regard this question as set at rest by Beaumont's observations, and think that the difference between these and severer affections is only one of degree—an opinion which is confirmed not only by their etiology, but also by the effects of treatment.

(a) Acute indigestion may assume various degrees of severity according to its causes or the previous health of the patient. In some cases it may present only the phenomena of a trifling "bilious" attack; in others it may last many days or weeks.

Its origin will ordinarily be found in some of the causes temporarily disturbing the digestion; a moral emotion, or severe exercise after a meal, indigestible food taken in excessive quantity, or food against which an idiosyncrasy exists on the part of the patient, are, however, among its most frequent causes. The first symptoms generally are a sense of fatigue, together with malaise, aching in the back or limbs, and depression of spirits; these are soon followed by epigastric uneasiness and distension, and sometimes by severe cramp-like pain in the stomach. During these attacks there is often a sense of faintness, the extremities are cold, and the pulse is weak, fluttering, and depressed, and the patient is often bathed in cold perspiration. Headache soon supervenes, generally frontal in position, sometimes of considerable severity, and not unfrequently associated with intolerance of light and sound. Nausea with increased flow of saliva follows, and the offending meal is rejected, accompanied by a great quantity of acid fluid; and with its expulsion the symptoms may cease. In other cases, instead of being vomited, the irritating matters pass into the intestines. Gripping and colicky pains then ensue; in some cases a spontaneous diarrhoea is set up which carries off the peccant material, but in others constipation, associated with flatulence and spasmodic contractions of the intestines, continues until the bowel is evacuated by a purgative. In the latter cases, pain, sometimes acute, is felt at the epigastrium; or there may be only an excessive sense of uneasiness and of weight or load at the præcordial region. There are complete anorexia and loathing of food, and nausea continues, often attended with ineffectual attempts to vomit. The tongue becomes loaded with a thick creamy fur; and though the amount of this varies in different cases, being sometimes thin enough to allow the enlarged papillæ to appear through, it always retains its soft, moist, milky appearance; the breath is offensive, and thirst is generally a marked symptom. In other and severer cases the circulatory and nervous systems may participate in the general disorder; palpitation, dyspnoea, faintness, vertigo, or a confusion of ideas may supervene; and when in the case of elderly people an excessive amount of flatus is generated, cerebral congestion may

occur to an extent sufficient to simulate an apoplectiform attack; while in children, and sometimes also in females, the implication of the nervous system may induce convulsive affections of the epileptiform character.

The headache which appears in the course of the slighter attacks of this nature often assumes a form with somewhat characteristic features, and which is familiarly known as the "*sick headache*." It is most common when acute exacerbations are superadded to the ordinary forms of atonic dyspepsia; and hence it is most liable to affect those who are out of health, and whose digestions are weakened by sedentary employment, and who have a tendency to costiveness. It occurs, however, also in persons of apparently vigorous health, sometimes without apparent cause, but most usually after some indiscretion in diet, or after some of the causes liable to arrest the digestive process.¹

The most usual time of its appearance is some hours after food has been taken, and very commonly the patient wakes with the pain at an early hour in the morning, especially when the last meal has been a late and indigestible supper. It may, however, supervene at any hour of the day. The attack is usually preceded for a longer or shorter period by some indistinctness of vision, sometimes affecting half the field of vision of one or both eyes; at other times diplopia occurs, or sight is disturbed by muscæ or by dazzling spots of light. Vertigo and noises in the ears may also appear among the prodromata. These are usually soon followed by pain in the head, at first slight, but rapidly increasing, until it becomes of great severity, which most commonly affects one or both temples, the frontal or in rarer cases the occipital region. There is often acute throbbing pain in the eyeballs, which are tender to pressure; though when the pain in the head supervenes, the indistinctness of vision usually disappears. If the pain lasts long the scalp sometimes becomes tender, and it not unfrequently remains so for some time after the attack. During the paroxysm the surface of the head, and particularly the forehead, is often cold, and in some cases the pain itself may be partially relieved by hot fomentations; at a later period the skin of the head generally becomes hot.

¹ Fothergill, who first described this headache (Med. Obs. and Enq., vol. vi.), attributed to "butter, fat meats, spices," and "meat pies," a special faculty in its production. Wood (Practice of Med., i. 564) says that it is frequently caused by excesses in the use of tea and coffee, but especially of the latter.

Other symptoms accompany the attack. The physical and moral depression is, in severe cases, extreme; light and sound are equally intolerable; sighing, yawning, or shuddering is often present, together with an extreme sense of general chilliness, amounting at times to rigor. Nausea is very common, and vomiting of acid food sometimes occurs—this appears sometimes, but by no means constantly, to relieve the patient. In other cases there is a great sense of uneasiness in the lower bowels, leading to ineffectual attempts at evacuation, and the only effectual mitigation in such cases is that produced by a purgative. The attack may last only for an hour or two, or may persist for twenty-four or forty-eight hours. When it is severe, complete relief is rarely obtained until after sleep has been procured, though this is unattainable during the height of the paroxysm. After sleep the patient awakes either free from pain, but feeling weak and nervous, or sometimes with a dull aching in the head, which gradually disappears. A loss of appetite, and diminished digestive power, which sometimes entail a liability to a speedy recurrence of the attack, often remain during some days.

The nature and immediate causes of these attacks have been a subject of much discussion. Dr. Anstie¹ has recently adduced some good reasons for regarding the pain, when seated in the anterior part of the head, as a neuralgic affection of the fifth nerve, and it is not impossible that this may be its real explanation, since other neuralgiæ of this nerve have been observed to follow disturbances of the stomach. It would appear that these headaches may be immediately produced by undigested food, either remaining in the stomach or which has already passed into the intestines; and this opinion is corroborated by the methods through which relief is usually obtained. Whether any special conditions of the food or of the secretions are concerned in their production must remain, as heretofore, in the absence of positive data, a matter of speculation.

Anorexia, pain, and thirst, with a loaded tongue and great general depression, may sometimes continue for days, owing to undigested food being retained in the stomach, and may disappear after this has been evacuated by an emetic, but in other cases the irritation remains long after its cause has been removed. The persistence of the symptoms above indicated, with certain others superadded, then forms the "*status gastricus*," "*saburral condition*,"

¹ "On certain Painful Affections of the Fifth Nerve," *Lancet*, 1866, ii. 32.

or "*embarras gastrique*" of the German and French authors, which may in most cases be traceable to some of the causes above indicated, but in others it occurs apparently spontaneously, or it may result from fatigue, over-anxiety, or probably from some of the epidemic influences before alluded to. There are then tenderness, load, and uneasiness at the epigastrium, together with great disgust for food, which, when taken, increases the distress, or causes nausea, and sometimes vomiting of mucus, or bile, or food acid from fermentation, together with acid watery fluids. Thirst is a marked symptom, and there is sometimes a craving for acid drinks; the tongue is more or less thickly covered with a moist white or brown fur; there is a bitter, nauseous, and sometimes metallic taste in the mouth, and an increased flow of saliva has been occasionally noticed. Fetid and acrid eructations and heartburn are often complained of, and the breath is heavy and offensive. The bowels are, as a rule, confined. In some cases diarrhoea may have been present at the outset, with colic and griping, but on ceasing it is followed by constipation; in rarer instances, in which catarrh of the intestinal canal is also present, it persists throughout, and is then attended with griping and with pale watery stools, which often irritate the anus and rectum when passed. There is great physical and intellectual oppression, together with a sense of fatigue and weakness, which may be the sole symptoms felt by the patient, or for which relief is sought; or these may be accompanied by a dull, confused headache, becoming sharper at intervals and not relieved by sleep. Sleep is unrefreshing, and is disturbed by dreams or night mare. There are often rigors and slight horripilation of the skin, especially towards evening, with a certain amount of febrile reaction, ending sometimes in acid perspiration during sleep: an icteric tint of the conjunctivæ is very common. The pulse, except during febrile accessions, is generally depressed and weak, and slower than natural, though easily accelerated on slight exertion. If fever supervenes, it becomes quick and full, but easily compressible. Urticaria and herpes sometimes complicate these attacks: the former is often caused by shell fish, or by substances against which the patient has a special idiosyncrasy;¹ the latter, when

¹ Mushrooms, cucumbers, almonds, oatmeal, pork pie, and mackerel (Budd, loc. cit. 266). Cubebs also has been known to cause it (Wood, Pharmacologia, i. 331). In some of these cases the invasion of the nettle-rash is not always accompanied with the signs of gastric disorder here mentioned. Herpes zoster, though preceded often by severe constitutional disturbance, is not so common a phenomenon of these attacks.

appearing in connection with acute attacks of indigestion, mostly affects the *alæ nasi*, the lips, and chin, and more frequently results from the use of malt liquors in persons with whom these habitually disagree, than from any other single cause with which I am acquainted.

The urine is usually scanty, acid, high-coloured, and loaded with lithates on standing; it may in some forms of acute indigestion occasionally present traces of albumen.

The duration of such an attack is uncertain: when appropriately treated, it usually terminates in a few days, though a certain irritability and weakness of digestion may continue for some time after; but when neglected, or when food is indulged in as usual, or if alcoholic stimulants are taken in excess to relieve the flatulence or feelings of prostration accompanying the attack, it may be prolonged almost indefinitely in a subacute form.

(b) There are, however, severe forms of the disorder, marked by considerable febrile reaction, which are very difficult to distinguish from febricula, or sometimes from early stages of typhoid, but in which the febrile reaction appears to be in reality attributable to the stomach. One class of these cases is marked by epigastric pain of some severity, which is generally central, but which sometimes radiates into the hypochondria and extends to the back. The sensation is sometimes one of heat or of burning, at others of load or constriction; but as a rule it does not present the same degrees of intensity as are observed in nervous gastrodynia or in the pain from ulcer and cancer. In other instances, however, pain is not complained of. Vomiting also occasionally occurs, and may be almost constant after everything taken, and be brought on even by the smallest amount of liquid—the matters rejected being mucus, sometimes tinged with blood; or bile in considerable quantities; and retching may continue even after the stomach has been emptied. The tongue in these cases may present the loaded “saburral” state before described, but it tends in a day or two to become red, raw-looking, and sometimes fissured; the papillæ are large and red, and the lips dry and cracked. Sordes sometimes appear on the teeth.

Thirst is usually considerable, and the appetite is completely lost.

Constipation generally persists, and sometimes with considerable obstinacy; but diarrhœa may occur, though this is comparatively unfrequent.

Rigors, to a mild degree, usually continue throughout the whole course of this affection. The skin is often hot to the hand, but except in cases of children the elevation of the temperature is rarely considerable and seldom above 100° Fahr.; but in children it may reach 103° or 104° Fahr. There is generally a considerable exacerbation of fever in the evening, and the diurnal remissions may be almost complete. The pulse is frequent, but weak and compressible.

Prostration with restlessness, and pain, though only of moderate severity, in the back and limbs, also continue throughout the attack: the headache also, which is ordinarily frontal, is frequently severe. Sleep is usually disturbed; and in children delirium may supervene, or a semi-comatose condition may be observed; strabismus occasionally occurs. I have never observed either sluggishness or marked contraction or inequality of the pupils. The urine is scanty and high-coloured, and deposits lithates.

Cough is spoken of as a common complication. I have not observed this, unless when, from a common exciting cause, such as cold, a bronchitis has been set up simultaneously with the gastric catarrh. Cough, associated with pyrexia, should always be regarded as a symptom requiring a careful and suspicious investigation of the lungs, for the condition which has now been described is often the accompaniment of early stages of phthisis.

The duration of this complaint, in its acute form and under proper treatment, is seldom longer than a week or ten days; but if treated at the outset with tonics and alcoholic stimulants, it is liable to become almost indefinitely protracted, and to pass into some of the more obstinate forms of chronic catarrhal inflammation.

(c) In young children, especially in infants under six months, or at the period of weaning, improper or excessive food sometimes causes a general catarrh of the whole gastro-intestinal canal. This may find its chief expression in diarrhoea, which frequently precedes the vomiting; but in many cases the latter is an important and even a dangerous symptom. There may be but little fever, and even when the skin over the abdomen is hotter than natural, the extremities and lips may be cold and bluish; and though the abdomen is sometimes tender, this is not constantly observed. Pain is, however, frequently evinced by cries, especially before the evacuations. These are liquid, watery, offensive, acid, and often grass-green in colour; they generally contain masses of coagulated

casein, and are often attended with straining or tenesmus: but when the attack is severe and the child much prostrated, they may be passed apparently unconsciously. The vomited matters consist of the coagulated milk, returned in an intensely acid condition, and accompanied with much acid watery fluid. Thirst is frequently excessive, but fluids taken are often rejected almost as soon as swallowed. The patient rapidly loses flesh, and great prostration sets in early, so that the infant may have difficulty in sucking, though it drinks with avidity. The pulse becomes weak and fluttering, the fontanelles are depressed, the countenance is pale, the eyes are sunken, and the features have a peculiar pinched, sharpened appearance. Somnolence, passing into coma or convulsions, may at times complicate the other symptoms, but the latter phenomena are not frequent. The course of this form is acute, and, if not early checked, it tends towards a fatal issue.

I have occasionally observed affections of this nature, though of somewhat less severity, and occurring at the period of the first dentition, alternate in a remarkable manner with eczematous affections of the skin.¹

It may be remarked that the symptoms of the choleriform diarrhoea of children correspond to a great degree, as far as regards the stomach, with those observed in true cholera in the adult. In the majority of the cases of this disease which have come under my observation, the stomach participated markedly in the catarrhal condition of the intestines,² and the thickly-furred tongue in many corresponded most closely with that of the "saburral" conditions which have been before described.

It appears, however, unnecessary to enter into fuller details of the symptoms of this affection, though it is not unimportant to bear in mind its pathological relationship to the class of diseases which we are now considering, and to remember that the diseased conditions excited by cholera may persist in the stomach long after the other leading features of the disorder have subsided. This has been observed by numerous writers, especially by Andral, Budd, and

¹ In one case, in a strong and otherwise healthy child, the eruption of each tooth was either attended with an attack of acute eczema, or by an attack of vomiting with diarrhoea; and, during one of the latter, the gastro-intestinal symptoms suddenly ceased on the supervention of the eczematous rash. It appears difficult to explain these phenomena, except on the theory of some *materies morbi* in the blood finding an excretory outlet either by the skin or mucous membranes.

² See report by author on appearances in cholera, Path. Soc. Trans. 1866-7.

Chomel; and their experience can, I have very little doubt from my own observations, be confirmed by any who have had opportunities of following the history of patients who have been subjects of the latter disease. Chomel's¹ "dyspepsie acide grave," with its acid vomitings, is the counterpart of that observed in children; but I have great doubts whether such acidity is the result of hypersecretion, and not rather the consequence of rapid catalytic changes in the food taking place under the influence of the unhealthy secretions of the stomach, especially as in some cases recorded by other observers it was found to be greatly increased by farinaceous food.²

(d) The symptoms of the typical acute form of gastritis are merely exaggerations of the milder varieties just described, the gradations observed consisting principally in differences in the degrees of severity; but the more marked characters of the disease are rarely met with except when the more violent irritants have been swallowed.

There is usually acute epigastric pain, though some remarkable exceptions have been observed in this respect by Dr. Habershon, even in cases where corrosive poisons have been taken.³ Its characters are burning and lancinating; it often extends into the back, and, when the affection is severe, it is not relieved by vomiting, and is increased by pressure. It is often accompanied by spasm and rigidity of the abdominal muscles, and is aggravated by each descent of the diaphragm, so that the respiration frequently becomes wholly thoracic.

Vomiting is a constant symptom: it is frequent, and is brought on by the smallest quantity even of cold fluids. There is also violent retching, which continues when the stomach is empty. The matters brought up are mucus, often tinged with blood, or blood blackened by the fluids of the stomach, together with bile and watery fluids. Diarrhoea is present in some cases, together with colic, tenesmus, and bloody stools, especially after arsenic, antimony, or corrosive sublimate have been taken; absent, or not so commonly met with, after the mineral acids, and caustic alkalies. There is complete anorexia, but great thirst. Prostration is marked, but often combined with agitation and restlessness. The face is pale

¹ Loc. cit., p. 144.

² See Guipon, Obs. 91, p. 436.

³ Oxalic acid, sulphuric acid, arsenic, and chloride of zinc. (Med. Times and Gazette, Nov. 20, 1859; and Diseases of Stomach, 1866, p. 41.)

and sunken, the voice weak or extinguished.¹ The skin is cold, and often covered with clammy perspiration, and the pulse is frequent and small. Hiccup is sometimes a very painful symptom, and may continue after the vomiting has ceased.

The duration of these symptoms is variable. Death may ensue with great rapidity by complete collapse; or the patient may linger for days and die from exhaustion; or long-continued irritability may persist for weeks, and subsequent dangers may ensue from hemorrhage, or from the contraction of cicatrices resulting from ulcerations in the pyloric region.

(e) The symptoms of inflammatory disorder of the stomach, complicating other acute diseases, are often considerably modified, or even masked, by the course of the disorders in which they occur. Anorexia and thirst are common to those in which we have no evidence to show that the affection of the stomach is of an inflammatory nature. I am inclined, however, to believe that in the majority of cases where, in addition to these, we find a loaded tongue and nausea after food, and even a slight degree of epigastric tenderness, this condition of the stomach is the cause of these symptoms much more frequently than is generally supposed to be the case, and I have had repeated opportunities of verifying this opinion by post-mortem examinations. In some, however—and this is particularly true of variola and scarlatina, and not unfrequently also of pneumonia—other and more distinct symptoms appear, in the form of vomiting. Spontaneous pain is not, however, usually present. Though these evidences of gastric inflammation are often more distinct in the disorders last mentioned than in some other of the acute diseases, yet, with regard to the whole class, the liability to this complication should be always recollected in considering the measures of treatment to be adopted.

(f) In the inflammation of the stomach that follows from drink, the symptoms are often very obscure. Vomiting, except in the morning, is comparatively rare, and signs of tenderness can with difficulty be elicited on pressure. The loaded tongue, the absolute anorexia, and the thirst, serve however as signs of an inflammatory condition of the stomach, of which confirmation is afforded, in some cases of fatal delirium tremens, by post-mortem evidence, and in

¹ It may be in some cases affected by the action of the irritant upon the epiglottis.

others, whose termination is more favourable, by the successful results of treatment directed towards this complication.

(g) Gouty attacks of inflammation of the stomach usually occur under two forms. The outbreak of the disorder is frequently complicated with all the symptoms before described as those constituting an acute attack of indigestion, which are sometimes relieved, but at others persist, when one or more joints have become the seat of the characteristic inflammation. The more severe and dangerous forms, however, are those attended by a sudden disappearance of the inflammation of the joints and by a simultaneous accession of epigastric pain and tenderness, together with vomiting, and accompanied by severe prostration, and these symptoms may proceed to a dangerous extent unless relieved by a return of the disease to its previous seat. Nor does the predominance of nervous symptoms in some cases at all preclude the possibility of even these being due to the suddenness and severity of the affection of the stomach, though the extreme degrees of flatulence and spasm which accompany them are in themselves almost sufficient to account for these phenomena.¹

THE PATHOLOGY of the symptoms here described involves the consideration of the *nature* of the condition in which they originate, and of the *anatomical alterations* by which they are accompanied, and upon which they in all probability depend. The evidence that these changes are of an inflammatory kind is in part directly demonstrable, and in part is the result of induction. In the milder forms we have seldom, if ever, an opportunity of experimentally verifying this opinion by post-mortem examination; but the observations of Beaumont, although too often forgotten in actual practice, seem to set this question conclusively at rest.

Having been conducted on a living subject, they possess the advantages of being records not only of changes affecting the glandular tissues, but also of conditions of perverted vascularity, which in the stomach, as in external parts, are only apparent while the circulation is still maintained, and which speedily become indistinct after life has ceased.

The appearances observed by Beaumont cannot be better described than in his own words: "There are sometimes found, in the internal coat of the stomach, eruptions or deep red pimples,

¹ See Garrod, On Gout, p. 505.

not numerous, but distributed here and there upon the villous membrane, rising above the surface of the mucous coat. These are at first sharp-pointed and red, but frequently become filled with white purulent matter. At other times, irregular circumscribed red patches, varying in size and extent from half an inch to an inch and a half in circumference, are found on the internal coat. These appear to be the effect of congestion of the minute bloodvessels of the stomach. There are also seen at times small aphthous crusts in connection with these red patches. Abrasion of the lining membrane, like the rolling up of the mucous coat into small shreds or strings, leaving the papillæ bare for an indefinite space, is not an uncommon appearance. These diseased appearances, when very slight, do not always affect essentially the gastric apparatus; when considerable, and particularly when there are corresponding symptoms of disease, as dryness of the mouth, thirst, accelerated pulse, etc., *no gastric juice can be extracted*.¹ "Complained of headache, lassitude, dull pains in left side and across the breast, tongue furred into a thin yellowish coat and inclined to dryness. Eyes heavy and countenance sallow. The villous membrane of the protruded portions of the stomach very much resembled the appearance of the tongue, with small aphthous patches, in many places quite irritable and tender."²

"The gastric fluids extracted were mixed with a large proportion of thick ropy mucus, and considerable muco-purulent matter slightly tinged with blood, resembling the discharge from the bowels in some cases of chronic dysentery." . . . "Flavour peculiarly fetid and disagreeable, alkaliescent, and insipid."

In other places he mentions the phenomenon of minor degrees of hemorrhage as not uncommon, "grumous blood exuding from several small points of the membrane."

It is remarkable that in many instances when these appearances were well marked, the symptoms experienced by the patient were but slight; and hence, *à fortiori*, we may conclude that when the latter are more severe, the anatomical changes are more considerable, though direct evidence of this is often unattainable.

The appearances³ thus described are, however, much less dis-

¹ Loc. cit., p. 99.

² Loc. cit., p. 171.

³ Pustular appearances of the glands have, however, been described by Rayer as occurring in the stomach (Diet. de Méd., x. 120), and also by Wahl (Virchow's Archiv, xxi. 579). In the latter case mucoidines were found in the glands. The

distinctly seen in post-mortem investigations; and the difficulty also of appreciating such evidences as are derived from the apparent vascularity of the organ is often very considerable.

As regards the phenomena of the latter class, two propositions, the converse of one another, may be laid down as true with certain limitations to be immediately explained. Firstly, that considerable vascularity is not necessarily evidence of inflammatory action; and secondly, than an almost entire absence of this appearance by no means excludes the pre-existence of this process.

Evidence in favour of the first statement has been abundantly accumulated since the time of Morgagni,¹ and more fully by Dr. Yellowly in 1818,² who was shortly followed by Billard,³ by Trousseau and Rigot,⁴ and by Andral.⁵ These authors have shown that partial hyperæmias and also general straining of the stomach may be determined by the position of the body, by the fluidity of the blood, and also by obstructions to its return from the abdominal organs existing in the vena portæ, the heart, or the lungs. Andral adds, that when death takes place during the act of digestion, hyperæmia of the stomach is generally found; but numerous exceptions will be found to this rule, when the examination has been made some hours after death.

Hyperæmia, of inflammatory origin, is almost invariably purely capilliform and punctiform. The latter appearance is due to small extravasations in the mucous membrane, and may arise from mechanical congestion as well as from inflammatory hyperæmia; and frequently the punctiform redness persists when the general injection, which may be reasonably presumed to have been present, has disappeared. Venous congestion and general imbibition can never, taken alone, be considered as signs of pre-existing inflammatory action. Nor is it always easy to distinguish, apart from other

appearance is, however, rare, and must not be confounded with enlargement of the solitary glands hereafter to be noticed. A similar appearance is described by Dr. Church, *Path. Soc. Trans.*, xx. 165, when the mucous membrane of the stomach presented an appearance as if covered by smallpox pustules, which seems to have been due to enlargement of the tubular glands, but without degeneration of their epithelium. The glands contained bacterides. Purpura had been present, and also vomiting for a month before death.

¹ De Caus. et Sed. Epist., xxix.

² Med.-Chir. Trans., iv.: "Observations on the Vascular Appearance in the Human Stomach which is frequently mistaken for Inflammation of that Organ."

³ De la Membrane Muqueuse Gastro-Intestinale. 1825.

⁴ Arch. Gén., xii.

⁵ Various places in "Clinique Médicale," and in "Prec. Anat. Path." 1829.

phenomena, the redness of congestion due to impeded return, from that which arises from inflammatory hyperæmia.

It appears, however, equally important to insist on the fact that although during life inflammation of the stomach is probably invariably associated with hyperæmia, yet that *post-mortem* pallor of its mucous membrane is no sign of the absence of previous inflammatory action; but that in here, as in other mucous surfaces,¹ even when inflammation has existed, the blood after death leaves the small superficial vessels, owing probably to their post-mortem contraction. The loss of colour in the stomach is also in part due to the action of the gastric juice, since even dilute acids may destroy the hematine, and the evidences of vascularity as I have seen in cholera are found in a direct ratio to the time after death at which the examination is made. Even after intense congestion from hepatic obstruction, sufficient to cause hæmatemesis, the stomach may occasionally be found to be pale.

It is only when stasis has existed to an extreme degree, or when punctiform extravasation has taken place from the capillaries, that the signs of inflammatory hyperæmia persist long after death; and even when present they seldom, except in cases of extensive inflammation from irritant poisons,² occupy more than patches of the surface.

¹ *E. g.* in the conjunctiva and in the skin after erysipelas. Andral, Clin. Méd., ii. 177. Congestion of the stomach to an amount sufficient to cause hæmatemesis may leave no traces after death. The bronchi are almost the only exceptions to this rule; but then it should be remembered that extensive bronchitis is almost always attended with congestion of the lungs, which prevents the blood escaping by the pulmonary veins, into which those of the bronchi open. The fading of colour is probably due to the contractile tissue accompanying the capillaries, but in the stomach it is also owing to post-mortem imbibition, and to the effects of the gastric juice.

² From many of these, as in the cases of arsenic, tartar emetic, and cyanide of potassium taken in large doses, hyperæmia is almost constantly present; but from others, as from phosphorus (Virchow, "Der Zustand der Magen bei Phosphor Vergiftung," Archiv, xxi. p. 399), it may be absent, and yet other signs of inflammatory action, presently to be noticed, may exist to a marked degree. Thinking that the importance of the subject in relation to diagnosis deserved a full investigation, I have made experiments on dogs to verify the opinion here stated. I placed ten grains of tartar emetic under the skin of the neck of each of two dogs, which had previously fasted twelve hours. Both commenced vomiting after an hour, but one continued to show the effects of the poison to a more marked degree than the other. They were killed after twelve hours by pithing. The one that had vomited least was opened immediately after death, and the mucous membrane of the stomach was found swollen, opaque, softer than natural, and delicately injected throughout. The other, which had been much the most affected, was not opened for thirty-six hours: swelling and opacity, and softening of the membrane, was here very marked, but the traces of injection had almost entirely disappeared, there being only a little uniform staining from imbibition. Very similar

Other changes, however, exist, which furnish safer criteria for the diagnosis of inflammation than can be derived from the absence or presence of vascularity taken alone. In the slighter forms they are, it must be confessed, somewhat difficult to distinguish, differing, as they do, only by a question of degree from those which occur in the physiological process of digestion, in which not only the vascularity, but also the colour and consistence of the membrane are affected.

These changes consist in an increased opacity, together with swelling and with varying degrees of diminution of consistence of the mucous tissue. The two first of these are distinctly described by Beaumont; and the increased opacity gives to the mucous membrane (apart from the colour produced by hyperæmia) a dead white appearance, corresponding to the "cloudy swelling" of Virchow which is observed in the kidneys in acute Bright's disease.¹

Microscopic examination of the mucous membrane in this condition shows that the secreting cells, and also the nuclei, are swollen, irregularly distending the tubules, and are filled with granular matter soluble in liquor potassæ and dilute acids, which gives them, by reflected light, and as seen with a low power, the appearance of white lines, while by transmitted light they appear unnaturally dark and opaque. The cells also often contain fat globules in variable quantity, but in severe cases they frequently break down without undergoing fatty degeneration, and the tubes become more or less filled with granular debris and detritus. See Figs. 2, 3, 4.

It is to this distension of the glands, by an abnormal accumulation of protein matters in their interior, that the swelling of the mucous membrane and the pustular appearance observed by Beaumont are chiefly due. The normal secretion of gastric juice is arrested by this state, but at the same time there is produced a

results were obtained in a parallel experiment made with arsenic. I believe that from the causes which I have mentioned, changes that would attract attention in the kidney, or in almost any other organ, are frequently passed unnoticed in the stomach, even by careful pathologists.

¹ A case of this kind is recorded by Guersant, art. "Gastrite," *Diet. Sciences Méd.*, xvii. 576, where a young lady died after long-continued vomiting, together with fever and abdominal pain. The mucous membrane was covered with a tenacious mucus, the glands were prominent, and the membrane thickened and moist. The membrane was *whiter than in the natural state, and of the colour of lard*. The vessels on the external surface were gorged with blood. The other organs were healthy. Guersant, not recognizing the inflammatory characters of this affection of the stomach, speaks of the disease as one *incerta sedis*. Carswell, *Illust. Elem. Forms of Disease*, recognized the occasional pallor of inflammatory softening of the stomach.

considerable amount of tenacious alkaline mucus, containing large quantities of the morphological elements of the interior of the glands, which are generally separate, but sometimes adhere in masses, and then resemble the casts of the tubes excreted in similar conditions from the kidney.¹

Fig. 2.

Fig. 3.

Fig. 4.

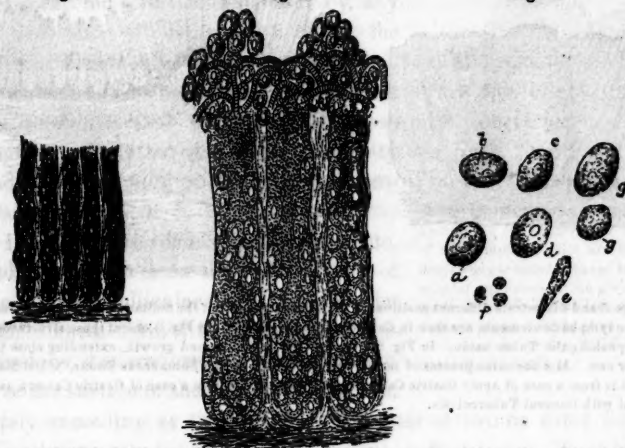


Fig. 2. Vertical Section of Stomach Tubes in a case of Acute Catarrh, $\times 90$ diam., showing the irregular outline and granular appearance of the glands.

Fig. 3. The same $\times 400$ diam. (reduced). The Tubes are filled with swollen epithelial cells, and with granular debris, arising from the breaking down of these. Enlarged capillaries are seen at the surface.

Fig. 4. Cells extruded from the Glands in a state of Acute Catarrh. *a, b, c.* Enlarged and Granular Spheroidal Epithelium. *d.* The same, treated with acetic acid. *e.* Swollen Columnar Epithelium. *f.* Free Nuclei. *g.* Enlarged cells containing double nuclei.

The softening of the mucous membrane which accompanies these changes is totally distinct from the post-mortem softenings, which are distinguished by the transparency of the tissue. It rarely exists to any marked degree, except in extreme cases, but there is always a certain diminution of resistance to the finger-nail or to the scalpel, which materially assists, when conjoined with opacity

¹ Described by Dr. Cayley, Beale's Archives, i. 198; also by Dr. Fenwick, loc. cit., in scarlatina. I have seen them in the catarrhal affection of the stomach in diphtheria, and also in catarrhal affections of the intestines. They are less frequent either in the stomach or intestines in cholera.

For further descriptions of these appearances see a paper by the author, Med.-Chir. Trans., vol. xlii.; also Dr. Schlaepfer, in Virchow's Archiv, vol. viii.; also Dr. Fenwick, Med.-Chir. Trans., xlvii.; also Virchow, in his Archiv, vol. xxxi., and Groh , lb., xxxiii.

and thickening, in distinguishing this condition. Louis's test of the extent to which it can be torn from the submucous tissue is a less available one, and applies rather to states of post-mortem solution than to this condition.

Fig. 5.

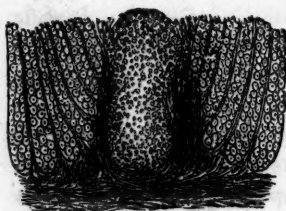
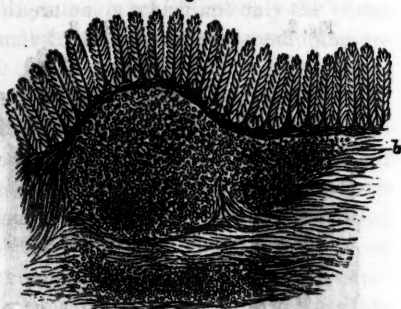


Fig. 6.



Figs. 5 and 6 illustrate different positions in which enlargement of the Solitary Glands and increase of the lymphatic elements are seen in Catarrh of the Stomach. At Fig. 5 one of these structures is seen pushing the Tubes aside. In Fig. 6 there is seen at *b* a second growth, extending close to a larger one. At *c* the same process of multiplication is seen in the Submucous Tissue, $\times 100$ diam. Fig. 5 is from a case of Acute Gastric Catarrh in a child; Fig. 6 from a case of Gastric Catarrh associated with General Tuberculous.

Coincidentally with these changes there is a considerable increase in size, if not in number, of the solitary and lenticular glands, which then appear as small white specks, varying in size from that of a poppy to a millet-seed, thickly scattered over the surface. They

Fig. 7.

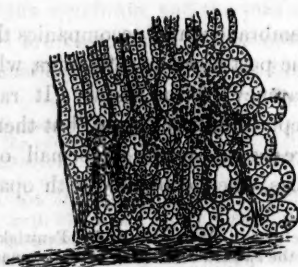


Fig. 8.

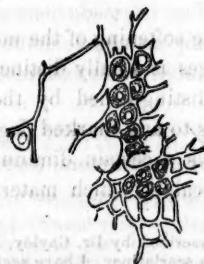


Fig. 7 represents the infiltration of the Tissue with Lymphatic elements in a case of Chronic Catarrh of the Stomach, associated with Heart Disease. There is no distinct limitation of the structure as in Figs. 4 and 5. $\times 100$ diam.

Fig. 8 exhibits the Structure of this Tissue $\times 1250$ diam. (reduced), showing cell elements imbedded in an alveolar network.

are most abundant in the pyloric portion of the stomach and also in the duodenum. A considerable thickening of the interstitial tissue simultaneously occurs, owing to its becoming infiltrated with cell-structures similar to the "lymphatic" elements existing throughout the intestine.¹ They are imbedded in an alveolar network, but are not separated by any distinct line of demarcation from the tubular structures around, which are sometimes widely separated, and more or less obscured by this growth; and these changes greatly increase both the density and the thickening of the mucous membrane. Figs. 7, 8, 9.

In some cases these structures ulcerate, and it is to this cause that the majority of the so-called follicular ulcers appear to be due. These form little cup-shaped depressions scattered more or less thickly over the surface of the mucous membrane, rarely exceeding at the surface a diameter of two or three lines, and seldom extending deeper than the submucous tissue. Their base is found to rest on a tissue infiltrated with lymphatic cells and with the granular débris of these, which may be generally also noticed for some distance in the surrounding tissue. Figs 10, 11.

Other ulcerations, which are of the nature of erosions, are not uncommon. They are more superficial, but they may attain the diameter of a fourpenny piece. Their edges are often sharply defined, but there is very little thickening around them; I have never seen them extending for any depth into the tissue, and they rarely involve the whole depth of the secreting glands. They appear to arise from a superficial epithelial erosion, sometimes extending rather more deeply into the tissue, and resulting probably from the process described by Beaumont as "stripping and rolling up of the membrane." Early stages of this condition are sometimes found, when in circumscribed patches, giving evidence of acuter inflammatory action, the mucous membrane is found to be superfi-

Fig. 9.

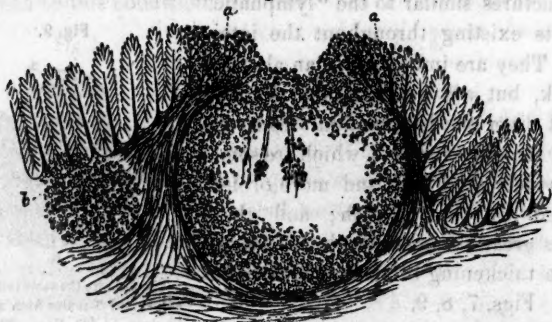


Fig. 9 shows the same infiltration among the Tubules from a case of Cholera, $\times 600$ diam. The walls of the lymphatic cells are indistinct, being blended with the intercellular substance of the alveolar network. At a, a, a are transverse sections of the Glands of the Stomach, seen in profile, filled with Glandular Epithelium.

¹ His, Untersuchungen über den Bau der Peyerschen Drüsen und der Darm Schleimhaut; Frey, Untersuchungen über die Lymphgefäße des Darmkanals. (Leipzig, 1863.)

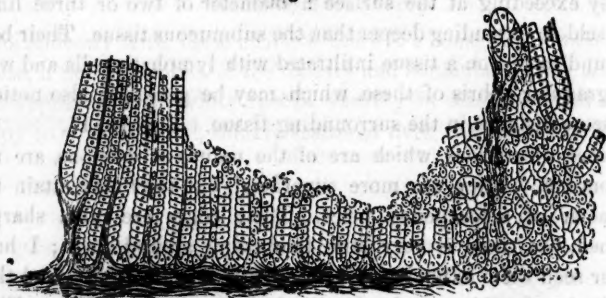
cially reduced to a pulpy débris, the separation of which would probably have led to a similar result.¹

Fig. 10.



Vertical Section of commencing Ulceration of a "Solitary Gland" of the Stomach in a case of Tuberculosis. The tissue between the Tubes at *a, a* is infiltrated with lymphatic elements, and the tubes and intervening tissue have broken down over the centre of the "Gland." The base of the ulceration is thus formed of lymphatic tissue; at *b* is seen a similar smaller growth invading the tissue around the bases of the Stomach Tubes. The clear space in the centre of the Gland is due to a portion of the tissue having broken out in the preparation of the section.

Fig. 11.



Vertical Section through a "Follicular Ulcer" of the Stomach in a case of Typhoid Fever, showing the spaces between the tubules infiltrated with lymphatic elements, which are undergoing fatty and glandular degeneration, leading to the breaking down of the tissue. $\times 200$ diam. (reduced).

In cases of a severe type, or when the affection of the stomach complicates septic or gangrenous inflammations in other parts, sloughs² may form on the mucous membrane, which may have a

¹ See Andral, Clin. Méd. ii., Obs. iv., p. 19.

² I am referring to instances entirely independent of corrosive poisons. I have seen them in gangrenous pneumonia, and similar cases are recorded by Recklinghausen (Virch. Arch. xxx.) and by Klebs (Ib. xxxii.).

diameter of from a half to a quarter of an inch, but I have rarely seen them proceed to any depth.

Smaller solutions of continuity may also arise from extravasations of blood, ending in superficial hemorrhagic erosions. These are, however, much more frequently the result of mechanical congestion than of acute inflammation.

Exudative inflammations on the surface of the stomach are rare; I have once or twice seen them in phthisis, and Sir W. Jenner has observed them in diphtheria, and Rayer¹ says that they have been noticed in cases of croup. Pain and vomiting have been observed in some of these cases, but no special symptoms seem to be attached to this condition enabling a diagnosis to be made.

Another and still rarer affection is that corresponding to the gastritis phlegmonodea of Cullen, which does not as yet appear to have been recognized during life, and which can hardly be included among the class of diseases which have now been described.

The leading symptoms have been acute pain in the præcordial region, together with vomiting, violent fever, and delirium,² ending speedily in death.

In cases recorded by Wallmann and Bamberger, the affection of the stomach appears to have been idiopathic, and to have been the only lesion present; but in two others, which occurred in the practice of Oppolzer,³ it commenced with puerperal fever.

In these instances the chief anatomical character has been supuration in the submucous tissues of variable extent, sometimes undermining the whole membrane, or perforating it in various places. Bamberger says that the abscesses thus formed may perforate other organs to which the stomach has formed adhesions, but the rarity of these affections renders them objects of pathological, rather than of clinical interest.⁴

Special descriptions of the appearances produced by the different kinds of poisons belong rather to the subject of medical jurisprudence than to the clinical pathology of the stomach. They will not, therefore, be referred to here.

¹ *Diet. de Méd.*, x. 124.

² Bamberger, *loc. cit.*, p. 260. Wallmann, *Wiener Allg. Med. Zeit.* Decr. 1856.

³ *Wiener Med. Woch.*, 1851, quoted by Bamberger. They are also described by Rokitanaki; by Engel, *Lehrbuch Path. Anat.*; by Andral, *Proc. Path. Anat.*, ii.; by Albers, *Erläuterungen*; Dittrich, *Caustatt*, 1857, iii. 179; Habershon, *Guy's Hosp. Rep.*, 3d Series, ii. 115.

⁴ See collection of cases by Reynaud, *Bull. Soc. Anat.*, Paris, 1861.

DIAGNOSIS.—The acuter inflammatory disorders of the stomach are usually recognized without difficulty. Some of the severer forms may occasionally be simulated by the neuroses, but the chief points of distinction from the latter have been already alluded to.

The slighter forms, especially when occurring in the course of other chronic diseases, and particularly in phthisis, are more liable to be overlooked, the increased prostration and loss of appetite being too frequently referred to the effects of the general disorder. In such cases, symptoms of indigestion of food are not always prominent, and the most valuable indication of the nature of the disease is to be derived from the appearance of the tongue, which, instead of being pale, broad, and flabby, as in the atonic state, becomes under these circumstances covered with a milky fur of more or less thickness, through which red papillæ appear. Thirst and constipation are often superadded.

The diagnosis of the febrile forms from typhoid is also often difficult, and sometimes doubt must continue to exist until after the appearance of the characteristic eruption of the latter. Points which may serve to assist in the diagnosis of the earlier stages are the swelling of the spleen in typhoid, together with tenderness or gurgling in the iliac fossa. The skin also is more frequently dry in typhoid, whereas in gastric catarrh perspirations are common. The temperature also is less elevated in the latter than in the former disease. Herpetic eruptions on the lips or elsewhere, which are common in gastric derangement, are very rare in typhoid.

TREATMENT.—The primary indication in the treatment of recent inflammatory affections of the stomach, is to secure for the organ as complete a rest as it is possible to obtain; and, in the milder forms, a tolerably complete abstinence from food for four-and-twenty hours will frequently do much towards effecting a cure. In severer cases, and where the disorder is more protracted, or when the patient is too weak to bear abstinence, as in the case of infants, much may be effected by nutrient enemata in sparing the stomach, and allowing it the necessary repose. Such food as is taken should, when the disorder is of any severity, be restricted to milk and lime-water, or milk and soda-water, administered in small quantities every two or three hours. In cases where milk disagrees, as it does with some patients, veal or chicken broth, or beef-tea, in small quantities, may be substituted for it.

In the case of infants suckling, the quality of the milk should be carefully examined, and, if the nurse is menstruating, a change is absolutely necessary. If obtained from the cow, the diet of the animal should be restricted to hay or fresh grass. In severe cases it is desirable that the child should be withdrawn from the breast for some hours, and a small quantity of rice-water, or of milk greatly diluted, should be given at intervals. In the case of infants, brought up by hand, the milk is to be largely diluted, and the addition of lime-water or of carbonate of soda is very desirable. When cow's milk absolutely disagrees, a change to ass's milk is sometimes sufficient to effect a cure; but this is not always the case, and medicinal treatment is often further necessary. A small quantity of farinaceous food, as arrow-root, sago, or gruel, may often be given with advantage with the milk; it appears to act beneficially by preventing the coagulation of the casein into lumps in the stomach.

In cases of less severity, in older children or adults, the lighter farinaceous puddings may be allowed. Solid animal food is decidedly to be prohibited as long as any nausea or pain at the epigastrium is caused by food entering the stomach; and when the needful rest of body is enjoined, this enforced abstinence may often be protracted, during some days, with decidedly beneficial effects. The return to a more nourishing diet is always to be effected gradually, and with caution. As the symptoms subside, the patient may be allowed a small quantity of fish, or minced chicken, eaten with bread, but without (at first) any vegetables, and he may gradually proceed to game, or tender mutton, taken once in the day; but it must be remembered that any indiscretion or excess in diet is very likely to bring on a relapse.

Alcoholic fluids are decidedly to be avoided except where great prostration is present. When a stimulant appears to be urgently required, brandy is usually the best form in which it can be given; and in the case of children, and even infants, it may sometimes be advantageously administered, properly diluted, or combined with beef-tea or milk, by the rectum. Champagne also is occasionally found to be advantageous in checking vomiting; but it is less efficacious when this symptom is due to inflammatory action than when it arises from sympathetic irritation, or from the erethism of exhaustion.

Rest of body is equally essential, and in severer cases, and par-

ticularly when diarrhoea is present, the patient should be kept in bed until the more urgent symptoms have subsided.

General bleeding is decidedly inadmissible, as the disease ordinarily tends to produce considerable prostration, and any large loss of blood is likely to entail serious consequences, and to retard the recovery of the patient. When pain is continuous, and appears to be unassociated with the presence of undigested food, but to be increased by the introduction of even small quantities of food into the stomach, leeches are often of service. They should not, however, be used in the case of children, unless under *very* exceptional circumstances, and in weakly persons the number should be restricted to two or three. If there is evidence of much congestion of the liver, or if hemorrhoids have been present, they may be applied to the anus; but usually they are best applied to the epigastric region.

Hot fomentations are of value; they should be applied continuously by means of flannel, spongio-piline, or linseed-meal poultices. Counter-irritation by mustard-poultices, or by friction with croton oil, or, in severe cases, with tartar emetic, may be occasionally resorted to with advantage. The warm bath is also frequently of decided service.

Emetics may be administered when the presence of undigested food in the stomach is indicated by cramp-like pain, nausea, ineffectual attempts to vomit, and faintness, but care is necessary in the use of these remedies; and the stronger agents of this class, and especially tartar emetic, or even mustard, are to be avoided (see *ante*), as they have been known to cause great aggravation of the symptoms. The best emetic is a scruple of ipecacuanha, and the emetic action may be aided by large draughts of lukewarm water, or of infusion of camomile; but if vomiting do not occur readily, it is undesirable to repeat the dose, a proceeding which may be followed by very injurious results. It must be remembered that the cramp-like pain originating in the stomach may continue in the intestines when the undigested food has passed into them; and further, as Bamberger has remarked, the effects and sensations attributed to the irritant may continue in the stomach in the same manner that the impression of the presence of a foreign body in the conjunctiva may persist long after its removal.¹

¹ That undigested food may, however, remain long in the stomach, and be the source of severe pain and discomfort, is shown by two cases related by Sir T.

For the condition known as "embarras gastrique," M. Martin Solon¹ has employed ipecacuanha in doses of six or seven grains, given three times in twenty-four hours. In most of his cases the medicine thus given produced bilious stools and vomiting; in several instances a single administration conducted in this manner accomplished the cure; and in others, when a repetition of the medicine was necessary, this was generally effected within three days. In a few cases the disorder was aggravated by this treatment, showing that it is only available within certain degrees of severity of the affection; but the presence of fever by no means contra-indicated its use.

In the milder forms of the affection, even when of some standing,² the utility of purgatives is considerable, and has been recognized since the days of Hippocrates.³ Their immediately beneficial effects were also plainly seen in several of Beaumont's observations,⁴ when the redness and aphthous appearance of the stomach, accompanied by a loaded tongue, frontal headache, and sallowness of skin, were relieved by full doses of calomel and aloes.

The best remedies in these cases appear to be mercurials in purgative doses. In the case of an adult and vigorous patient, calomel may be advantageously given in doses of from three to eight grains, and followed after some hours by a draught composed of: magn. sulph. three drachms, magn. carb. two scruples, tinct. jalapæ half a drachm, in aq. menth. pip.; or by castor oil, or the haust. sennæ co., or the decoct. aloes comp. When such active effects are undesirable, the blue pill, with compound colocynth pill and ipecacuanha, often proves very serviceable, and it may be followed by a seidlitz draught, or by any other moderately purgative mixture.

In the case of the acute indigestion of children beyond the period of infancy, when there are fever and griping, or even when the latter is absent, a dose of calomel and scammony, or of hyd. cum crotâ with rhubarb, followed by castor oil, sometimes proves beneficial; but children in this complaint bear purging less than

Watson, in one of which a mass of casein, and in another an accumulation of snuff, were vomited, after causing, during several days, severe gastric pain and disorder. (Lectures, ii. 440.)

¹ Gaz. Méd. de Paris, 1836, No. xvi. I have not resorted to this plan, as I believe, from my own experience, that an active purgation produces equally good effects, with less discomfort to the patient.

² Andral, Clin. Méd., ii. 186.
³ "Anorexia, heartburn, vertigo, and a bitter taste in the mouth of a person free from fever, indicate the want of purging upwards and downwards." (Aph. 17, lib. i. sec. iv. Syd. Soc. Trans.)

⁴ See loc. cit., pp. 118, 182, 266.

adults, and frequently a dose of castor oil will, if followed for a day or two by suitable care in diet, perform all the service that can be obtained from this class of remedies.

In severer cases, where there is much irritability of stomach, together with frequent vomiting and pain, purgatives by the mouth should be avoided, and they are generally inadmissible when diarrhoea is present, unless there is reason to suspect that undigested food is still retained in the intestines; and the action of the bowels may be procured, if this appears necessary, by aperient enemata.

In rarer instances, when much constipation has preceded or attended the attack, and when vomiting is severe and troublesome, calomel in half-grain doses frequently repeated has been found useful in checking the latter symptom; and a similar indication has been fulfilled by the use of the mixt. magn. sulph. cum magn. carb., repeated at intervals until the bowels have acted freely.

Purgatives are also the most efficient immediate remedies for the relief of the sick headaches, though the state of the digestion in which they originate often requires careful attention. Mercurial or saline purgatives are the most efficient in their action, but the activity of the doses should be proportioned to the strength of the patient. Dr. Wood recommends in severe cases the combination of sulphate of magnesia with morphia. The powder Guarana, or *Paullinia Sorbilis*, recently brought before the notice of the profession by Mr. Wilks,¹ is in some cases very efficacious in the removal of these attacks, though sometimes it fails. It is also to be noticed that idiosyncrasies exist in this affection, with respect to the action of different remedies. In one class the attack may be averted, when the premonitory symptoms are first perceived, by alcoholic stimulants, ammonia, or opium, while in another the headache is aggravated by these, and is only relieved by purgation, or occasionally by vomiting.

With these exceptions, it is always undesirable to continue the repeated exhibition of purgatives, the effect of which is likely to prove as injurious as a single dose is beneficial, and is liable not only to aggravate the stomach disorder, but to cause an extension of the complaint to the mucous membrane of the duodenum and intestines, if these have not already suffered. Some caution is

¹ Brit. Med. Journ. 1872.

also necessary in the earlier stages of the febrile forms of the disorder, lest a case of typhoid should be mistaken for one of simple gastric disorder, and serious consequences be entailed on the patient by the administration of a class of remedies which, in the former complaint, must always be regarded as sources of extreme danger.

After the administration of emetics and purgatives, and in the severer cases when these are inadmissible, our main reliance must be placed on sedatives and antacids.

One of the most valuable of the former of these is cold, though it is rarely, if ever, advisable to employ it externally; sucking small pieces of ice, however, often affords great relief to the uneasiness of the stomach and to the vomiting. Thirst may also be quenched in this manner; but the desire of the patient to drink largely is to be restricted, as distension of the stomach is liable to maintain the tendency to vomiting.

When the vomiting is severe, opium may be administered in full doses with advantage. It is, however, more useful in the severer than in the milder forms of the disorder: and in the latter, which are more appropriately treated by purgatives, salines, and antacids, it is seldom beneficial, and sometimes even proves the reverse.

Hydrocyanic acid is of inferior advantage in checking vomiting in this disorder, but it may be given with occasional benefit in effervescing draughts, containing an excess of alkali.

Bismuth, either in the form of the trisnitrate or subcarbonate, has a peculiarly favorable effect in all the milder forms of inflammatory action; and I have found it more beneficial than any other remedy in the gastro-intestinal catarrh of children. The bismuth should be given in doses of from three to five grains to children, and from ten to twenty grains to an adult: it may be combined with magnesia or hydrocyanic acid, or, when pain or diarrhoea is present, with morphia or tinct. opii.

Carbonic acid is also a valuable agent in relieving pain and vomiting. The mode of its administration has been already alluded to.

In milder cases Vichy, or Seltzer, or soda-water forms a very valuable mode of administering antacids and salines; of the former which is particularly useful in the later stages of subacute inflammatory attacks, a pint, or a pint and a half may be taken daily between the meals. The beneficial action of the alkalies is in these

cases due in part to their effect in neutralizing the acidity resulting from fermentative changes caused in the food by the unhealthy secretions of the stomach, but I think it probable that some share in their efficacy is also attributable to their direct action on the mucous membrane. Bamberger speaks highly of the value of muriate of ammonia in cases where the disorder threatens to become chronic.

As a general summary of the treatment it may be stated that in the milder forms of the disease one or two doses of a brisk mercurial cathartic, followed by antacids, magnesia, bismuth, Vichy or Seltzer water, and a careful restriction in diet during the attack, will usually bring the disorder to a termination in three or four days. In the severer cases, when pain is felt after food, and vomiting is troublesome, purgatives and emetics are contra-indicated; and repose as absolute as can be obtained for the patient and for the organ, together with opium, ice internally, or small quantities of effervescent drinks, and leeching, fomentations, or counter-irritation to the epigastrium, are the indications principally to be relied on for obtaining a cure.

A weakened state of the digestion, entailing a liability to fresh attacks, often continues after the acuter symptoms have subsided; it is attended with a feeling of languor and of inability for active exertion, and not unfrequently with flatulence or occasional heartburn, or with some other of the symptoms of atonic dyspepsia. This state requires great care in treatment, and the use of the so-called bitter tonics demands especial caution, as their untimely use will often perpetuate a chronic form of subacute inflammatory action.

The general rules laid down for the treatment of atonic dyspepsia are those most applicable in these cases; and attention to diet is to be pursued with additional caution, which is to be especially extended to vegetables and fruit. Exercise should be moderate, and should not be pushed beyond a degree sufficient to cause a slight and healthy feeling of fatigue. Chills should be carefully avoided; for patients in this condition are as liable to "take cold" in the stomach as others, in whom the respiratory system is weakened, are to attacks of bronchitis. Alcoholic stimulants are only to be used in great moderation—dry sherry (the Manzanilla or Amontillado being the best), or weak brandy and water, or claret and water, are the most suitable forms for their administra-

tion; malt liquors, and also the use of coffee, are to be decidedly forbidden. If all signs of irritation have disappeared; while those of atony continue, and if the deficiency in the appetite indicates the use of bitters, calumba and *nux vomica* are those most applicable; these may generally be advantageously combined with the mineral acids, and should be given immediately before food is taken.

Pespine, also, often proves very serviceable at this stage.

If anæmia be present, the milder ferruginous preparations are to be employed in the manner indicated under the head of Atonic Dyspepsia.

Care and patience are at all times necessary in cases of this description. The tendency is to a cure, if it be not interfered with by undue haste on the part of the patient to regain strength, by taking food in excess of the digestive powers of the stomach, or by the use of stimulants beyond a degree which the weakened tissues are able to support without their normal action being perverted to inflammatory irritation.

Purgatives, which the sluggish condition of the bowels may sometimes appear to render necessary, are also to be used with great care. Aloes is usually the best form that can be selected; but the use of enemata is to be preferred. In children, small doses of rhubarb and soda, or of the domestic Gregory's powder, are often decidedly advantageous; or friction with aloes may be employed on the surface of the abdomen.

In infants, small quantities of magnesia will often answer all indications in this respect; but in them the tendency to diarrhoea is more marked than in adults, and purgatives are seldom necessary.

In older children and in adults, the action of the bowels is often facilitated, and irritability of the gastro-intestinal membrane greatly relieved, by wearing over the abdomen, either during the day or night, a compress wrung out of warm or cold water, and protected by a piece of mackintosh. It should be changed three or four times in the twenty-four hours.

Change of air and scene, as spoken of under the head of Atonic Dyspepsia, is sometimes necessary in weakly patients to complete a cure.

IV.

CHRONIC GASTRITIS.—CHRONIC CATARRH OF THE STOMACH.

SYNONYMS.—Chronic Inflammatory Dyspepsia, Morbid Sensibility of the Stomach (Johnson); Gastrite Chronique, Fr.; Chronisches Magen Catarrh, Germ.

This disease embraces a large number of the cases of obstinate chronic dyspepsia. It includes, in the author's opinion, many of the disorders which have been described as *irritative* dyspepsia, and even some which have been ranked among the nervous disorders, and especially those forms which have been regarded as resulting from "morbid sensibility"—a condition which in mucous membranes is much more commonly the result of minor degrees of inflammatory action than of mere derangements of innervation. Confusion has also been introduced into the nosology of this disorder by the fact that both ulcer and cancer of the stomach¹ have been included in some of the descriptions given of its symptoms and pathology.

THE ETIOLOGY of this affection is somewhat complex, since the disorder may either exist *ab origine* in a subacute form, perpetuated by the persistence of its exciting causes, or it may remain as an effect of an acute attack, which has weakened the nutrition of the mucous membrane, and has thus induced a liability to minor degrees of inflammatory action from slight causes. It is therefore difficult logically to define in all cases the limits between the predisposing and the exciting causes, since many of each class act apparently in both directions.

The disease appears to be to a certain degree hereditary, but no special etiological influences can be attributed either to sex or age, as it is common at all periods of life.

The impaired condition of the digestive powers which has been described under the head of Atonic Dyspepsia induces liability to inflammatory disorders of the stomach, and hence the causes of

¹ Cf. Andral, Clin. Méd.

this state may all act as indirect predisposing causes of the irritative forms, both of the acute and of the chronic kind.

Among the constitutional diseases which appear to involve a special liability to this affection—though often acting apparently in diverse manners—may be mentioned scrofula, phthisis, gout, albuminuria. Diseases tending to disturb the portal or abdominal circulation, such as emphysema, heart disease, and, *a fortiori*, cirrhosis of the liver, involve also a special liability to chronic gastric catarrh, through the congestion which they occasion in the mucous membrane of the stomach. The following table exhibits the principal diseases with which I have found either acute or chronic catarrh in 100 stomachs examined:—

Acute Catarrh.	No. of Cases.	Chronic Catarrh.	No. of Cases.	Acute and Chronic Catarrh combined.	No. of Cases.
Pneumonia, Acute	2	Tubercle of Lungs (uncomplicated)	4	Tubercle of Lungs (uncomplicated)	2
Pneumonia, Chronic	1	Tubercle of Lungs, Tubercular Peritonitis	1	Tubercle of Lungs, Tubercular Pericarditis, old Valvular Disease of Heart. Liver Fatty. Kidneys Granular	1
Varicella	2	Tubercle of Lungs and Intestines, Bronchi-Ectasis, Morbus Cordis	1	Tubercle of Lungs, recent Bright's Disease	1
Puerperal Peritonitis, with recent Bright's Disease	2	Tubercle of Lungs and Intestines, Liver Fatty	1	Morbus Cordis	2
Perimetritis Puerpera, with recent Bright's Disease	1	Tubercle of Lungs, Morbus Cordis, Granular Degeneration of Kidneys	1	Morbus Cordis, Cirrhosis of Liver, recent Pneumonia	1
Phlebitis, from various causes, associated with first stage of Bright's Disease	2	Tubercle of Lungs, Morbus Cordis	1	Pneumonia (uncomplicated)	1
Endo-Pericarditis, first stage of Bright's Disease	1	Chronic Bright's Disease, Fatty Liver	2	Pneumonia, Phlebitis	1
Suppurative Peritonitis	1	Morbus Cordis, Gangræna Pulmonum	1	Morbus Cordis, Gangrene of Lung	1
Cholera; Kidneys in first stage of Bright's Disease	2	Morbus Cordis, Caries of Pelvic Bones	1	Pneumonia, recent Bright's Disease	1
Typhoid Fever	1	Melanosis of Lung, Pleurisy	1	Puerperal Fever	1
Morbus Cordis	1	Cystic Disease of Ovaries, Peritonitis	1	Typhoid Fever	1
Morbus Cordis, Capillary Bronchitis	1	Abscess in Oesophagus	1	Delirium Tremens	1
Tubercle of Lungs and Tubercular Peritonitis	1	Hernia	1	Cirrhosis of Liver	1
Diabetes	1	Drunkard. Other pathological conditions not noted	1	Suppurative Peritonitis. Kidneys Fatty	1
Carcinoma Ventriculi	1				
Total	21	Total	19	Total	17

One remarkable fact which appears from this table, especially in the contrast between cases of recent and chronic catarrh, is the greater proportionate frequency with which the former is associated with acute, and the latter with chronic, inflammatory affections of other organs; and it would seem as if the same exciting cause not unfrequently sufficed to produce similar changes in the ultimate structures of many organs simultaneously.

The tendency of diseases obstructing the venous circulation to induce chronic catarrhal conditions of the stomach is also well illustrated in this table; but the remarkable frequency with which they are associated with phthisis is especially apparent, having been present in 28 per cent. of the whole number, or in sixteen out of thirty-one, or nearly one-half, of the tubercular cases examined.¹

Of the more direct exciting causes, among the most frequent must be placed either an habitual excess in eating, or a constant use of food that disagrees; especially by persons whose general health and digestive power are below the healthy standard: by this means a series of minor attacks of indigestion of an irritative type are excited, which at times alternate with acuter forms of "embarras gastrique," from which such patients are continually liable to suffer.² It cannot be too strongly insisted on, that the tendency of undigested food is always to give rise to gastro-intestinal irritation, whether the cause of the indigestion reside in the stomach, or in the quality or excessive amount of the food or drink, or in some of the other accidental conditions mentioned among the general causes of dyspepsia,—of these deficient insalivation or imperfect mastication, or the habits of mental or physical work after meals, are among the most frequent.

The habitual use of spirits, particularly when undiluted, or when taken to any amount that can be considered excessive, is also an

¹ The author's more recent observations, though not capable (from peculiar circumstances) of being framed statistically, have fully confirmed his opinion of the etiological influence in this direction of these classes of disease; and he has been increasingly struck with the frequency of the coexistence of the anatomical conditions to be described, as found in chronic catarrh, with cirrhosis of the liver and with granular conditions of the kidney, to which they bear the strongest resemblance. Dr. H. Jones's observations also give some support to this view, for, in twenty-three cases of catarrh of the stomach, he found tubercles in four and disease of the lungs in eleven more, while in eight there was disease of the kidneys, and in three disease of the heart.

² Broussais (Leo Phleg. Gastriques, p. 183) says that the causes which in adult age perpetuate a chronic irritation would, in the earlier periods of life, have produced an acute attack.

almost unfailing cause, when long-continued, of chronic inflammatory changes in the stomach; and it is seldom in cases of this nature that some of the post-mortem changes hereafter to be mentioned cannot be discerned.¹

Chronic or subacute catarrh of the stomach is also a very frequent accompaniment of cancer and ulcer of this organ, as well as of pyloric obstruction. The question of the mode of its causation in the two former of these diseases is one of no little difficulty, but it is probably to its agency that many of the derangements of digestion observed in their course are attributable.

Medicinal causes deserve also some consideration, and especially the abuse of stimulants and tonics or purgatives in many of the forms of atonic dyspepsia; nor can other remedies be absolved from the onus of having occasionally produced these effects, which have been attributed to the prolonged use of arsenic and bichloride of mercury, and occasionally of cubebs and copaiva.

There are some cases of syphilis recorded, accompanied by symptoms closely resembling those characterizing this group of diseases, and which have been cured by the administration of mercury. The evidence of their nature is incomplete, but, pending their complete elucidation, I am inclined to believe that, judging of the effects of this poison on other tissues, such disorders are most suitably classified among the inflammatory affections of the stomach.

Lastly may be mentioned, mechanical irritants of all kinds.²

THE SYMPTOMS of this disorder are primarily those of indigestion of an aggravated kind, but they are often varied and very irregular in their course; nor are they always united in one case, some being at times more prominent than others. It is of this class especially that the remark made with regard to the general symptoms of indigestion will be found to be true, that the condition may often be revealed by the general state of the system, or by impairment in the functions of some other organ, rather than by symptoms appreciable by the patient himself, as truly proceeding from the deranged stomach.

¹ The average ratio, in persons who have indulged in these excesses, of deaths from the digestive organs (including diseases of the liver) to deaths from all causes, according to Nelson's researches, amounts to 12.47. ("Vital Statistics," quoted by Parkes on Hygiene, p. 299.) I believe that the amount of injury to the stomach is much underrated, since changes in this organ often escape observation, and are rarely directly the cause of death.

² See a case, of pins swallowed by an hysterical woman. (Mr. Marshall, Med.-Chir. Trans. xxxv.)

In many cases there are at times intervals of almost complete immunity from apparent dyspepsia, but these are seldom complete, and are speedily followed—often with no apparent cause—by returns of the old symptoms, and with exacerbations of an acuter kind, after the slightest indiscretion in diet; and this irregularity is of no small value in distinguishing the nature of the complaint, having its parallel in most of the chronic inflammatory affections of other mucous membranes.

Those referable to the stomach are a sense of weight, oppression,¹ distress, or undefined uneasiness of the epigastrium, ensuing after meals, and often associated with distension from flatulence, which sometimes may be very considerable; a sense of tightness and constriction at the sternum, or a feeling of fulness in the pharynx and œsophagus. In other cases an uneasy, ill defined sensation of discomfort is felt in the dorsal region between the scapulæ, though rarely also in this situation amounting to the acuter pain met with in ulcer and cancer. The sensations complained of generally commence within half an hour to an hour after taking food, and continue more or less during the whole period of digestion. Other discomforts follow at a later period, such as intestinal flatulence, and borborygmi, together with an increased sense of distension and oppression, especially felt in the right hypochondriac region. Sometimes these uneasy sensations, when accompanied by acidity, are relieved by taking more food; but this alleviation is frequently only temporary, and is followed by an increase of the original discomfort.

The ingestion of food is rarely, if ever, a cause of immediate pain; and this is not, indeed, a prominent or (with any severity) a frequent symptom, though it may occasionally arise if much mucus is secreted, or when flatulence is present.

Tenderness on pressure is not usually a marked symptom, though some degree of it often exists. Heartburn and acidity are often very annoying, but they are by no means constant.

Nausea, to a certain degree, is not unfrequent, but it is seldom distinctly felt; and vomiting is rare, except in certain special forms, associated with either albuminuria, congestion, the dyspepsia from drink, and occasionally with phthisis.

The appetite presents considerable variations. It is capricious,

¹ *Barre* of the French writers, described "as if a bar were pressed across the epigastrium, or base of the chest."

and generally it is diminished, though not, as a rule, to a marked degree. Eating is, however, soon followed by a sense of satiety; and the feeling of discomfort and fulness at the stomach which often ensues, even during a meal, serves at once to check the desire for food; though if this be neglected, and a full meal taken, the symptoms are usually increased in severity. In other instances there is the same sense of sinking, and of craving for food, which is observed in some of the neuroses, and which must in these cases be considered as a perverted sensation arising from the condition of gastric irritation; though it should be borne in mind that nervous erethism may at times complicate this complaint, and introduce much complexity among the symptoms observed.

Thirst is a very prominent and distinctive symptom, and it is hardly ever absent in cases of inflammatory irritation of the stomach, whether this be acute or chronic. It exists during meals, but is most marked in the intervals, when the patients have an extreme craving for fluid; and this is particularly felt in the evening, if the chief meal has been a late dinner. The feeling is not only one of thirst, but a sense of languor, oppression, exhaustion, or internal heat is often combined with it, which is relieved by drinking, and especially by cold fluids; but in some cases even these give distress, and warm drinks, especially tea, are eagerly taken, though often in the latter case only to be followed by increased discomfort, acidity, and flatulence.

The breath is often heavy and offensive. There is frequently a bad taste in the mouth, which is ordinarily most marked on first rising in the morning. The gums are spongy, red, swollen, often retracted from the teeth, and inclined to bleed, and the saliva and buccal mucus are occasionally acid. An excessive flow of saliva is not uncommon, and is particularly observable at night, when it may escape from the mouth during sleep, wetting the pillow. The lips tend to become dry and cracked, and the fauces are liable to erythematous inflammation, with slight superficial ulcerations. The pharynx also may be the seat of a granular inflammation, associated with excessive secretion of a tenacious mucus, which is a source of great annoyance and discomfort to the patient.

The conditions of the tongue present some variations; but as these are valuable aids to diagnosis, they deserve to be especially dwelt upon.

(a) If associated with distinct atony, the tongue may be broad, somewhat pale, and flabby, but the papillæ generally are enlarged—this being most apparent in the fungiform papillæ on the tip and edges, which are also redder than natural, and there is a thin white fur over the surface. Sometimes, however, this fur may be present when the papillæ, though enlarged, are pale.

(b) In the more distinctly irritative forms, and especially in children who have any signs of scrofula, and in phthisical adults, the whole organ is redder than natural, and may be of a bright florid colour, and even raw-looking; it is often pointed at the tip, which, together with the sides, presents an extreme degree of injection, and the papillæ stand out as vivid red points. There may be at the same time a coating of variable thickness along the dorsum. This form is frequently associated with aphthæ, especially at the tip, and sometimes on the inside of the lips; or with painful spots on the tongue, which are found on close examination to be papillæ slightly abraded.

(c) In older persons, and particularly in those in whom the dyspepsia is the result of excessive or hurried eating, the tongue, while presenting some degree of enlargement and redness of the papillæ at the tip and edges, is often uniformly covered throughout the greater part of its extent with a thicker fur, sometimes whitish, and occasionally of a browner tint, which more resembles the coating attending the acuter attacks, and which patients recognize as a symptom of "biliousness."

(d) Lastly, it must be mentioned, that in cases which I cannot but regard, as far as my experience extends, as being exceptional, though more common where the catarrh of the stomach is secondary to local causes of congestion from venous obstruction, the tongue may present very little deviation from the natural condition, though occasionally, even in these, transitory formations of a white fur on the dorsum may be observed on repeated examinations.

Some of the intestinal symptoms have been already alluded to. In addition it must, however, be noted, that constipation is often obstinate; it is frequently associated with much uneasiness in the rectum, and it greatly increases the general feelings of oppression, malaise, and languor. The stools may be dry and scybalous, and are not unfrequently coated with a considerable amount of tenacious mucus, which may form casts of portions of the intestinal canal. Occasionally they are passed with tenesmus and straining;

sometimes they present thin flattened bands; and they are usually accompanied or preceded by the escape of flatus. They are generally pale, both in this state and in another occasionally met with, when the constipation is less marked, and when one or two large, pultaceous, often offensive, and sometimes frothy motions, containing considerable quantities of undigested food, are passed in the day—when there are often griping pains in the abdomen, and a liability to severer attacks of colic. In other cases the two conditions alternate, or slight causes may give rise to transitory attacks of diarrhoea, which may afford temporary relief, but are commonly followed by an aggravation of the intestinal flatulence and of the general discomfort, and are often attended with increased signs of irritation on the tongue and with the production of aphthæ, as before described.

Piles are a not uncommon complication of this state, even when evident disease of the liver is absent.

The cutaneous surface shows various indications of the perverted general nutrition of the body. It is often dry and harsh, sallow, earthy, and wrinkled; and at times, after slight indiscretions of diet or without assignable cause, patients are liable to suffer from eczematous or impetiginous eruptions, which may be followed by a perceptible alleviation of the symptoms.¹ Children are more liable to suffer from these, and occasionally from herpetic eruptions, than adults; but gouty patients, and those who drink excessively of malt liquors, are occasionally subject to them. A vinous tint on the malar bones and nose is also, by some writers, attributed to the disturbance of the stomach.²

The hair tends to become dry, harsh, and prematurely gray; sometimes it is lost in considerable quantities when acuter exacerbations supervene. The nails are often furrowed, and have a tendency to split. In children who suffer much from irritative

¹ A case of this kind lately came under my notice, of a young lady whose father is liable to gout, and who had for years been liable to an aggravated form of irritable dyspepsia, but whose symptoms almost entirely disappeared for many months since the eruption of an eczematous rash on her face. Trousseau (*Clin. Méd.*, ii. 1862, p. 280) has noticed that in dyspeptic patients who resort to sea-bathing, a febrile condition, followed by urticaria, frequently results, and that the eruption on the skin is followed by a great relief to the symptoms of the stomach. Allusion has been already made to the occasional concurrence of this disorder, with some of the forms of acute indigestion, and a somewhat similar instance is also mentioned by Schmidtman (*loc. cit.*, iii. 225): "*Novi mulierem in qua herpes faciei cum cardialgia alternabat; extante in facie herpete a cardialgia vacabat; eo disparente, extemplo duris torquebatur ventriculi doloribus.*"

² Rayer, *Dict. de Méd.*, x. 156; Chomel, *ib.* x. 92.

dyspepsia during the second dentition, the teeth are often irregular, with thin enamel, and are crenated at the edge, while the anterior, and, to a less degree, the posterior surfaces are marked by vertical depressions of sulci.¹ In adults the teeth suffer from premature caries, often erroneously attributed to the use of mineral acids given for the cure of the complaint, but more commonly due to impaired general nutrition, and especially to the spongy condition of the gums and to their retraction above the enamel.

Emaciation is almost constantly observed when the disorder has persisted for any length of time, though it is not early in its appearance, unless the patient has been previously out of health, or the disease is severe; but a gradual loss of flesh and strength is an almost constant symptom, and one that should, in the absence of other signs of disease, cause a special attention to be directed to the state of the digestive organs.

Coldness of the extremities is a very common symptom, and it is not unfrequently attended with flushing of the face and oppression of the head. Patients of this class are almost always chilly. They are liable to slight rigors, and to suffer much from changes of temperature, which are often followed by an aggravation of their sufferings.

Febrile reaction of a slight type, preceded by rigor and malaise, is common. It often appears to be directly associated with the taking of food, or of alcoholic stimulants, but in other cases it seems to have a special tendency to exacerbation in the evening; sometimes returning with such regularity as to have given rise to the suspicion of a malarial cause, and to have led to the ineffectual use of quinine.² The skin becomes hot and dry, especially in the feet and hands; but in other cases these may be cold, while a great sense of heat is complained of in the trunk and head. It occasionally occurs at night, and then is often followed by copious perspirations during sleep.³

¹ This condition of teeth is very common among children to whom "gray powder" has been administered at the time of the second dentition; but I have frequently observed it, independently of this cause, where there has been much dyspeptic disturbance at this period. In a third class of cases it is hereditary, appearing when the digestion is good; but it is not unfrequently associated with scrofula.

² Chomel, *Des Dyspepsies*, p. 79.

³ It may be well here to recall the aphorism of Hippocrates, in relation to the causation of many of these forms, which has been already alluded to: "A copious sweat after sleep, occurring without any manifest cause, indicates that the body is using too much food." (*Aph. 41, sec. iv.*)

There may be at times an icteric tint of the conjunctivæ, but this is not observed with any considerable frequency. Slight attacks of ocular conjunctivitis, sometimes attended with phlyctenæ, are by no means uncommon.

Slight catarrhal affections of the air-passages are also not unfrequent. Those of the fauces and pharynx have been already alluded to; but the same condition may invade the larynx, giving rise, in some cases, to injection, with relaxation of the vocal cords, and thus causing dry cough, or hoarseness and huskiness of the voice; or the affection may extend deeper, and be the source of a muco-purulent secretion, which is often aggravated during the febrile accessions which occur after meals, and especially after wine has been taken, and may give rise to cough coming on at these periods.

Dyspnoea, and a desire to sigh, are very frequently complained of. They are sympathetic symptoms, common to all forms of indigestion, but are very marked in the variety now under consideration.

A very interesting and important question connected with this subject is the connection of these disorders to the causation of phthisis.

By some authors¹ disturbance of the digestion has been considered to be an immediate cause of the development of pulmonary tubercle; while by others the relation of the two conditions has been considered as accidental; or it has been held that the irritative dyspepsia, so often observed in phthisis, is secondary to the tuberculizing process in the lung.

It would appear, however, to the author that in cases where long-continued irritative dyspepsia has preceded disease of the lung, the latter has required for its production some other exciting or predisposing causes than the simple impairment of nutrition produced by the mal-assimilation of the food. In the majority of instances where they coexist, both the gastric and pulmonary disturbances have either appeared to be due to an unhealthy constitutional condition, and have been developed and advanced almost *pari passu*, each accession of pulmonary disorder with pyrexial disturbance being associated with a fresh attack of gastric catarrh,

¹ Wilson Philip, Mr. Hutchinson (Med. Times and Gazette, 1855). The dyspepsia, preceding phthisis, has been attributed by Dr. Hughes Bennett and Mr. Hutchinson to a dislike to and mal-assimilation of fatty substances.

which has tended to become chronic; or the derangement in the stomach has been secondary to that in the lung, and caused either by pyrexial conditions, or by impairment of the general health, or, possibly, by reflex irritation.

The urine, in most of the chronic inflammatory affections of the stomach, is more constantly affected, in various ways, than in the other forms of disturbance of digestion before noted. The most common of the changes presented are the deposits of urates, earthy phosphates, and oxalates. None of them is peculiar to this form, and, moreover, urine of high specific gravity, and characterized by the deposit of urates, is almost invariable in the acuter stages of inflammatory dyspepsia.

Earthy phosphates, with urine, sometimes of a high, and sometimes of a low specific gravity, and often alkaline and cloudy on emission, are very common. The specific gravity depends, in some measure, on the amount of fluid taken with the meal preceding the period at which the urine is passed; and thus it is commonly low in the morning after breakfast, and generally higher in the evening, when the exertions of the day, and the food taken, have probably increased the amount of urea. By some authors this condition of cloudy, alkaline urine, which often becomes iridescent on standing, has been referred to duodenal indigestion,¹ this idea having probably arisen from the fact that this deposit in the urine frequently corresponds with the period at which the food passes into the intestines, and with the aggravation of the symptoms of malaise and flatulence which often occurs at that time. The author is inclined to believe that the alkalescence of the urine in these cases may be in part due to the defective secretion of the liver and pancreas; of the former of these we have evidence in the pale, clayey stools, and also some presumptive proof in the great increase of flatulence which occurs in the intestines. The fact that these deposits often alternate with urates, and sometimes with oxalates, lends a further support to this view; since the latter seem to be invariably associated with a faulty assimilation or metamorphosis of protein and saccharine matters,² and may probably depend on the abnormal condition in which these enter the blood

¹ Cf. Yeats, Some observations on Duodenum, Med. Trans. Coll. Phys. 1817, p. 351, and Mayer, Krank. des Zwölffinger-Darms, p. 10.

² Parkes, On the Urine, p. 225; Roberts, loc. cit. p. 43; Golding Bird, p. 159.

after the imperfect intestinal digestion caused by the deficiency in supply of those secretions.

The deposit of urates is often associated with the febrile heat complained of after meals, but the same symptom has been noted in connection with both oxalic and phosphatic deposits.¹

The nervous system participates markedly in the general disturbance.

Languor, lassitude, pains in the trunk and limbs—the latter sometimes dull and aching; sometimes, when in the scapular region, severe and lancinating; at others directly affecting the muscles, and simulating conditions of chronic rheumatism—a feeling of inability for exertion, especially marked after meals, and often felt on rising in the morning; irritability or excitability of temper, intellectual depression, loss of judgment, and of the reasoning powers, and of memory, characterize this state. Hypochondriasis occurs also more commonly in connection with this condition than with almost any other form of dyspepsia. Fear, timidity, anxiety; despondency to such a degree that, “in a merchant surrounded by affluence, apprehensions of impending beggary often embitter the moments that are free from the excitement of business; in the mechanic, unfounded ideas of immediate loss of employment, and visions of the interior of a workhouse, are generally present.”²

Headache and a feeling of tension are frequently present; but the sick headache is not so common in advanced forms of the disease (unless under the supervision of acute attacks of indigestion), as in the simple atonic or acute forms; the feeling being generally rather one of fulness, or of dull pressure, in the occipital or frontal regions. Vertigo is occasionally met with, especially when irritation has supervened on the atonic form; but with this exception it is, comparatively speaking, rare in this variety.

The expression is anxious and careworn, and, in conjunction with the emaciation and sallow tint of skin so commonly present, gives to the individual a look of premature age.

Extreme degrees of sleeplessness are very common; or when,

¹ Golding Bird, loc. cit. pp. 244, 291. Phosphatic urine and oxaluria may, indeed, occasionally occur when the condition is one of simple atony or neurosis, but it is probable that when they are persistent, or of any severity, some conditions of organic irritation, tending still further to impair the digestive power, are almost invariably present.

² Ibid. p. 308. This mental state, so graphically described by Dr. Bird as occurring in connection with phosphatic urine, may be found in conditions of irritative dyspepsia, when these changes in the urine are not at the time present.

after hours of restlessness, sleep is at length attained, it is disturbed by dreams and nightmare, and is sometimes associated with nocturnal emissions.¹

The heart's action is often irregular, and easily excited to painful palpitation on slight exertion, conjoined with which there may be at times some irregularity of action. The pulse is accelerated during the febrile movement following digestion; it is then full and compressible; at other times it becomes weak and slow, in proportion as the patient loses strength by the continuance of the dyspepsia.

In the foregoing sketch a description has been given of the leading symptoms which correspond to cases where the anatomical characters, hereafter to be described, are found; but the whole of this group does not invariably appear simultaneously. The course of the disorder is also modified by the various etiological conditions under which it occurs, bringing certain symptoms into greater prominence than others, and also by its occasional complication with some of the neuroses, to which reference has previously been made, and which are among the chief sources of obscurity in the diagnosis of the severe forms of both affections.

The most typical examples of the disease, as affecting both the digestive organs and the nervous system, are those where irritative dyspepsia has supervened in a debilitated constitution, and has been preceded by the symptoms of atonic dyspepsia. They are yet more marked if, in such a constitution, there is any taint of hereditary gout, which may not have been revealed by a distinct attack, but where the emaciation, weakness, and hypochondriasis are familiar to all who have had opportunities for observing these complaints.

In the scrofulous forms in children, the attention of the parents may be directed only to the pallor, weakness, and gradually progressing emaciation of the patient, and the evil is constantly aggravated through ill advised attempts to improve the nutrition by forcing increased nourishment on a stomach already incapable of digesting the normal amount. Phthisical dyspepsia, on the other hand, is often painfully complicated by the diarrhoea proceeding from ulcers in the intestines, but which, possibly, in some degree, aids in preventing the oppression and hypochondriasis which so

¹ Chomel.

frequently attend the constipation presented by some of the other varieties.

There yet remains a group of cases where vomiting constitutes a more prominent symptom than in those which have hitherto been passed in review, and where there occurs a profuse secretion of mucus, and which stand in the same relation to the forms in which this is not so apparent as a bronchorrhœa, or leucorrhœa, or nasal catarrh occupies to the drier forms of inflammation of the mucous membrane from which those fluxes may proceed. The cases where gastrorrhœa is a prominent symptom are ordinarily those of congestion of the stomach from pulmonary, cardiac, or hepatic disease, and of dyspepsia in habitual drunkards, in which the last-named cause of congestion often, I believe, plays a prominent part; and to these must be added many cases of albuminuria.¹

Sometimes the vomiting in albuminuria occurs on first rising in the morning, when it is occasionally relieved by food;² under these circumstances it is possible that it is of cerebral origin, and is caused by the disturbance of the nervous centres through the poisoning of the blood; but in a large class it takes place within half an hour to an hour after food has been taken. Pain, though sometimes present, and occasionally severe, is, however, but rarely complained of; and though much acidity is sometimes present, the reaction of the vomited matters may be at other times alkaline; but the cause of this difference has not, as far as I am aware, been made the subject of special observation.

In the dyspepsia of drunkards the vomiting of mucus is often one of the most prominent symptoms. It usually occurs in the morning, and is easily excited by slight stimuli. During the rest of the day there may be comparatively little disorder in the stomach, though acidity and flatulence are sometimes present, and the appetite is often greatly impaired. In other cases a painful sense of sinking is experienced at the epigastrium, together with a craving for the accustomed stimulant, which too often replaces

¹ Bernard's experiment has shown that after extirpation of the kidneys a continuous secretion takes place from the stomach without any necessary alteration of its mucous membrane; but in cases of longer duration of Bright's disease pathological observations have convinced me that the stomach seldom fails to exhibit signs of subacute inflammatory action (see also Rayer, *Mal. des Reins*, ii. 347). These anatomical changes are probably due to the continuance of the unnatural secretions.

² Christison, *Granular Degeneration of the Kidneys*, p. 96.

all desire for food. The disturbances arising from this indulgence affecting the nervous system, the ascites and sallow skin, the icteric tint of the conjunctivæ, and the signs of cirrhosis belong more properly to other sections of clinical medicine and pathology.

In some cases, however, a symptom common to it and to other forms of congestion occurs, viz., hæmatemesis, which may occasionally be profuse, and return with such frequency as to threaten life, and to reduce the patient to an extreme degree of anæmia. The severer forms are most frequently associated with cirrhosis of the liver, causing obstruction of the portal vein; but minor degrees of the affection often appear in conjunction with disease of the kidney. It is very probable, judging from the results of post-mortem observation,¹ that hemorrhage not unfrequently takes place without being disclosed by the blood vomited, the matters brought up being chiefly alkaline mucus (sometimes considerable in amount, and which may here and there only have a coffee-ground tint), bile, or altered food. Sarcinæ are occasionally found in the vomited matters of the whole of this group of cases.²

Pain in these cases is a symptom which is variable in the frequency of its occurrence; it is often complained of after each meal, but is seldom, if ever, of marked severity. Flatulence is almost constant. Acidity is common, but is not comparatively so frequent. The progress of the disorder, in other respects, depends much on the complications with which it is connected.

PATHOLOGY.—The changes which accompany the more marked forms of this disorder are tolerably characteristic. Many of them are apparent to the naked eye; others are only disclosed by microscopic examination. The most distinctive of these are alterations in the vascularity of the mucous membrane, changes in its colour, increase in its thickness and resistance, occasional increase of the lymphatic elements in the intertubular tissue, and various forms of degeneration of the glandular and other structures.

The degree of post-mortem vascularity, however, presents the same difficulties as a criterion as were mentioned in the description

¹ See Handfield Jones, "Stomach," p. 91, where grumous blood was found in the stomach after death, none having been vomited during life. I have met with several such cases.

² For the more special description of the nature of the matters ejected, the reader is referred to the chapter on Vomiting as a symptom.

of the appearances observed in the acuter form; and even congestion from obstruction, sufficient to give rise to hemorrhage, may leave no distinct traces in the mucous membrane after death. Often, however, the long continuance of distension of the vessels produces an amount of dilatation, which, when combined, as the affection frequently is, with exacerbations of an acuter kind, gives greater post-mortem evidence of hyperæmia than is found in the cases when inflammatory action has been of shorter duration.

Where much congestion has been present, the hemorrhagic erosions previously alluded to are also common,¹ and they depend on an extravasation of blood in the substance of the mucous membrane, which results from capillary rupture. They seldom exceed two or three lines in diameter, and they are generally superficial; but they may be sometimes seen extending through the whole depth of the mucous membrane. In some places the tissue may be seen still infiltrated in patches, where the blood has been effused, without detachment of the softened surface; but in others there are seen little pits or depressions with a blackened base, and with sides still infiltrated with blood, which, on microscopic examination, is found to occupy the tubules, staining their epithelial contents. They may possibly in some cases be the source of pain, but, when small, they appear to have little other pathological significance.² Vascularity may be found in any part of the mucous membrane; but changes of colour and thickenings of the tissue are more common in the pyloric portion, as also are many changes in the glandular tissue hereafter to be described.

The most characteristic change in colour is an ash-gray pigmentation,³ which, when closely examined, is found to depend on minute black specks scattered closely over the surface of the membrane.

¹ Willigk, *Prager Viertel-Jahreschrift*, vol. 51, gives their frequency as 1.8 per cent. of all the bodies examined. I know of no statistics mentioning their relative frequency to causes likely to produce these extravasations.

² Larger extravasations appear, however, sometimes to serve as the origin of the chronic ulcer of the stomach.

³ Andral described a milky-white colour of the membrane as characteristic of chronic inflammation. There is generally a certain degree of opacity induced in this condition; but unless an acute affection should have supervened before death I do not think that it is common in this disease, except in spots resulting from fatty degeneration of the gland, presently to be noticed. In some of his cases the appearances described are those of the cicatrices of ulcers. (*See Clin. Med.*, ii. 153, 154.)

It is generally most marked in the pyloric half of the stomach, though traces of it may occasionally be met with near the cardia. When examined with the microscope, these spots are found to depend on pigment derived by imbibition from the hæmatin of the blood, and deposited in a minutely granular form in the cells of the connective tissue between the tubes, and sometimes in the epithelial contents of the latter. (See

Fig. 12.



Pigmentary Deposits in the Villi of the Pyloric Region, in the case of Chronic Catarrh. The pigment is seen at *a* within the cells of the connective tissue; at *b* in the nuclei of the glandular epithelium; at *c* it is free among the elements of the tissue. $\times 340$ diam. Treated with acetic acid.

Fig. 12.) It is most commonly met with when mechanical causes of congestion have coexisted with catarrhal changes, and requires probably, as an antecedent condition for its production, the rupture of capillaries in the superficial layers of the membrane; and it is very commonly associated with similar changes in other parts of the intestinal tract. But though its presence is a valuable indi-

cation of the nature of the causes in which it has had its origin, its absence by no means excludes the diagnosis of past inflammatory action, of which other and independent evidence can be found in the consistence of the membrane and changes in the glands, and which, though often associated with pigmentation, can also frequently be discovered when this is absent.

Thickening and induration of tissue are an almost uniform result of chronic inflammatory action in the mucous membrane of the stomach. This may at times acquire an extreme degree of firmness and resistance,¹ tearing with great difficulty and being capable of being stripped from the submucous tissue in large pieces. There may be sometimes a slight degree of softening of the surface, when recent inflammation has supervened on the chronic form, but it does not usually extend sufficiently deeply to affect the general characters of induration which are so characteristic of this state. These changes depend on an increase of the interstitial tissue between the glands, which is often associated with atrophy of the latter; but it may also exist when this secondary change has not ensued.

¹ This was noticed by Broussais (Leç. Phleg. Gastriques, 1823, p. 105), who gave it the term "coriaceous." I have frequently found the membrane almost as tough and resisting as leather.

Enlargement of the solitary glands, together with an increase of the lymphatic interstitial growths between them, is common, though not constant, in this form.

The mammillation considered by Louis¹ as a constant sign of inflammatory action, and coincident usually with the other appearances now described, has given rise to considerable diversity of opinion among pathologists regarding its origin.² It is almost invariably found in the neighbourhood of the pylorus rather than in that of the cardia, where only very slight traces of it can be discovered. The appearance described by Louis, of irregular prominences more or less rounded, of two or three lines in diameter, separated by sulci, and resembling the granulations upon wounds, when found in a healthy stomach most commonly results from the contraction of the muscular layer shown by Brücke³ to exist around the basis of the secreting glands.⁴ A very similar appearance may, however, be produced by hypertrophy and distension of the gland tubes with the products of secretion,⁵ forming, together with the thickened interstitial tissue,⁶ small granulations,⁷ which are often rendered increasedly apparent by the atrophy of adjacent structures, and which thus present a counterpart in the stomach to the conditions observed in the granular kidney, and in cirrhosis of the liver.

Coincidentally with the above, other changes take place in the secretory structures which must necessarily tend greatly to impair

¹ Rech. Anat. Path. 1826, p. 111, "Etat Mamelonné."

² See Hodgkin, Morbid Anatomy of Mucous Membrane, ii. 280.

³ Bericht der Wiener Akad., 1851.

⁴ If sections are made of membranes in this state, after hardening in chromic acid, it will be seen that the depressions consist of a group of from ten to twenty glands dragged down, as it were, below the surface of the others, but perfectly healthy in every other respect, and with no sign of atrophy of the glands, or of alteration of the surface.

⁵ Andral, Clin. Med., ii. 76.

⁶ It is, I think, possible that the mere thickening of the interstitial tissue, especially when this is induced by a rapid increase of lymphatic growth, may in some instances alone suffice to induce this appearance. Dr. Fenwick (Diseases of Stomach and Duodenum) divides Gastritis into two varieties, the tubular and intertubular. The former may exist without the latter in the acute form, but the latter is in my experience seldom, if ever, found without degenerative changes in the glands.

⁷ Polypoid growths of various sizes may form, especially in the pyloric region, which are due to the same cause (Rokitanski, Path. Anat., 1861, iii. 154, 155). They are not necessarily associated, however, with inflammation, though they are often very marked around cancers of the stomach. See also Andral, Prec. Path. Anat., ii. 50, 53; Clin. Med., ii. 60. A complete monograph on this subject has been published by Ebstein, Reichert and Du Bois Raymond's Archiv, 1864.

their functional activity. They may be briefly summed up as consisting in fatty degeneration of the glandular epithelium, associated with thickening of the membrana limitans, and finally tending to changes in the shape, or atrophy of the glands.

Fatty degeneration of the glands generally occurs in the stomach, as in other glandular organs, in scattered groups, of one or two lines in diameter, giving the appearance of small, dead white spots imbedded in the mucous membrane. When microscopically examined, the epithelium of the tubes is either found fattily degenerated or the cells have entirely disappeared, and the contents of the tubules consist of nothing but free fat granules. (See Fig. 13.) The tubes are often irregularly narrowed and puckered, and thickening of the membrana limitans may not unfrequently be observed around their bases;¹ and these changes lead finally to the obstruction

Fig. 13.

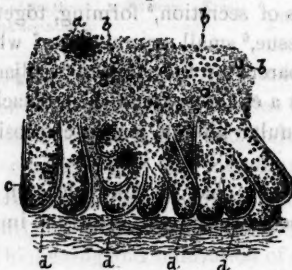


Fig. 14.

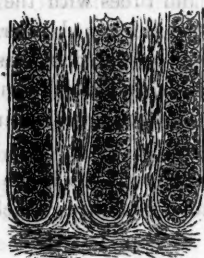


Fig. 13. Stomach Tubes (vertical section) in case of Chronic Catarrh. $\times 290$ diam. *a*. A mass of pigment in upper layers of membrane. *b, b, b*. Free fat drops. *c*. Thickened membrana limitans. *d, d, d*. Entire fatty degeneration of the epithelium.

Fig. 14. Chronic Catarrh. Section treated with acetic acid. Shows the increase of connective tissue between the glands, and thickening of the membrana limitans of the glands. The cloudy appearance of the epithelium is due to the action of the acid.

of the tubes at some part of their length, and to the formation of cysts, from the distension of the portion below the obstruction with the products of secretion.²

¹ See Figs. 13, 14. This, which is an inflammatory change, met with also occasionally in the acuter forms, requires to be distinguished from a fallacious appearance of the same kind which sometimes follows the addition of liq. potassæ or liq. sodæ to a section of a healthy mucous membrane. The pathological change may be recognized without reagents, or in glycerin, which does not produce this effect.

² See Figs. 15, 16, 17. For further details on the structure of these cysts, see Dr. Handfield Jones, "The Stomach," Virchow, Die Krankhaften Geschwülste, vol. i., and the author, Med.-Chir. Trans. vol. xli.

Spots of fatty degeneration are also found, affecting both the gland-tubes and intestinal tissue, which sometimes extend through

Fig. 15.

Fig. 16.

Fig. 17.

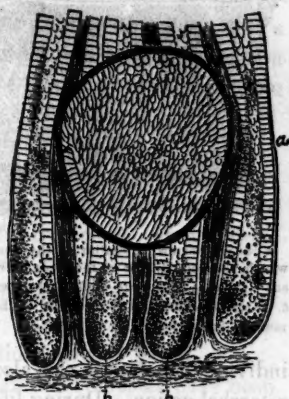


Fig. 15. Cystic degeneration of a Gland in the Pyloric portion. The Gland Tube is seen continuous with the lower portion of the Cyst. The Glands around have their Epithelium in a state of fatty degeneration. $\times 100$ diam.

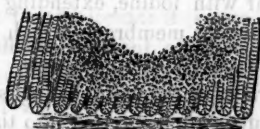
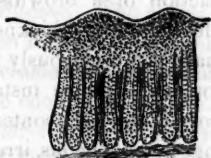
Fig. 16. A Gland Tube which has undergone a double constriction in its course, probably an earlier stage of the foregoing. $\times 340$ diam. *a*. Thickening of the Membrana Limitans. *b*, *c*. Points of constriction where the Connective Tissue is greatly thickened. *d*. Fatty degeneration of the Epithelium.

Fig. 17. A Cyst from the Pyloric portion of the Stomach, showing the contents to be Cylindrical Epithelium; at *a* is seen a capsule of Fibrous Tissue surrounding it; *b*, *c*. Glands in a state of Chronic Catarrh. $\times 340$ diam.

the whole thickness of the membrane, and are in some cases attended with a similar degeneration both of the capillaries and of

Fig. 18.

Fig. 19.

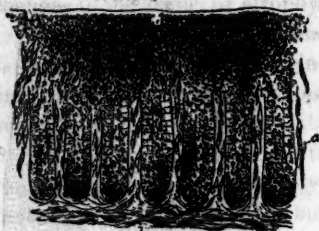


Figs. 18, 19. Fatty changes in upper layers of Mucous Membrane, leading to erosion of the surface. $\times 100$ diam.

the smaller arteries leading to the spot affected. These changes sometimes lead to a breaking down of the tissue (Figs. 18, 19, 20),

which resembles that seen in the superficial fatty degeneration of the lining membrane of the aorta, to which Prof. Virchow has applied the name of "fatty usur."¹

Fig. 20.



A change somewhat similar to the above, in which the cells *a, a, a* of the Connective Tissue are seen in a state of fatty degeneration. *b.* Fatty degeneration of the Cells of the Sub-mucous Tissue.

Cases of chronic gastro-intestinal catarrh are sometimes found associated with the lardaceous, waxy, or amyloid degeneration; which, however, usually only occurs in these viscera when other tissues of the body, the liver, spleen, kidneys, and mesenteric glands, are largely affected with the same disorder. The extent to which the degeneration proceeds differs in individual instances, as also do the signs of the accompanying catarrhal action. During life, diarrhoea is often present, especially when leucocythæmia or albuminuria have coexisted;² in other instances I have observed this change associated with absolute anorexia, and in one case with great irritability of the stomach and vomiting. Hæmatemesis has also been observed by Dr. Grainger Stewart;³ it may be a question whether this is due to the increased brittleness of the arterial coats, since I have observed a similar condition in the vessels of the skin in a case of purpura.⁴ I have also found the disorder associated with much hyperæmia of the stomach, together with thickening and induration of the mucous membrane, and with fatty degeneration of the epithelium in parts where the specific lardaceous changes were but little apparent. These present the well-known reaction of a brownish-red colour with iodine, extending to variable depths of thickness in the mucous membrane, which is also usually simultaneously found in the villi of the intestines. In the stomach, in some instances, all traces of the epithelial cells are destroyed, and the contents of the tubes are converted into the refracting, homogeneous, irregular

¹ Cellular Pathology, Chance's Translation, p. 340.

² Bennett, Princ. and Pract. Med. 532. Löschner und Lambl aus dem Franz Joseph Kinder Spital, Beobachtungen und Erfahrungen, 1860, p. 341 et seq.

³ Bright's "Diseases of the Kidneys," p. 98, and British and Foreign Med.-Chir. Rev., January, 1868.

⁴ British and Foreign Med.-Chir. Rev. 1865.

masses, into which the histological elements of the tissue are always changed in cases of this disease.

The exact relationship borne by this degeneration to the catarrhal conditions has not as yet been fully elucidated; it is probable that the two disorders may proceed *pari passu*; and such a combination is most prejudicial to the digestive process, as is seen from the rapid and marked emaciation which is so common an attendant on the lardaceous disease.

The DIAGNOSIS of chronic catarrh of the stomach presents many difficulties, and in some cases the recognition of its etiological relationships is necessary for its successful treatment. Among these may be especially mentioned the forms when vomiting occurs from alcoholic excesses, from albuminuria, and from congestion through cirrhosis of the liver, to which, however, no further allusion appears necessary than the descriptions already given.

The chief points of distinction from atonic dyspepsia have been already alluded to.

The distinction between chronic catarrh and disturbance of the functions of the stomach from nervous derangement may be difficult in some cases of hypochondriasis, and also occasionally when vomiting forms a prominent symptom of the former class.

With respect to hypochondriacal affections, the diagnosis is often obscure, particularly as both forms are not unfrequently simultaneously present. Pain and severe uneasiness are more constantly complained of in hypochondriasis. Pyrexia, thirst, acidity, flatulence, or other disturbances of digestion, especially when associated with impairment of nutrition, are more distinctive of catarrh. The tongue also affords, in some cases, a reliable clue to the nature of the disease. The character of vomiting in catarrh is less easily mistaken for that of nervous origin. In the former it is rare and only occasional, and mucus is an almost constant product. In neurotic conditions the vomiting is never constant. It then occurs soon after food: it is rarely associated with cachexia, or with the signs of disordered digestion just indicated. The existence of an hysterical diathesis, or of some of the other distinguishing features of the neuroses, is usually also a sufficient guide to an accurate diagnosis.

The diagnosis from ulcer and cancer may be doubtful in those cases in which vomiting is frequent, and especially when hæma-

temesis occurs. Hæmatemesis in chronic catarrh is, however, almost invariably associated with congestion, and the diagnosis of its origin must depend mainly on the absence of severe pain aggravated by food, and on the discovery of causes of obstruction to the venous circulation in the liver, heart, or lungs. On the other hand, when chronic inflammatory action is complicated by neuralgic pain, we have other criteria in the absence of hemorrhage or of the signs of a tumour.

Tenderness on pressure also is entirely absent, or exists only in a much slighter degree in catarrh than in cases of ulcer and cancer.

THE TREATMENT of chronic catarrh of the stomach requires considerable diversity, according to the varied etiological conditions under which the disease may occur.

In cases succeeding an acute attack, the sedative plan of treatment is that which is usually followed by the most favourable results. Of all single remedies bismuth is the one which ordinarily proves the most efficacious, and it may often be advantageously combined with magnesia, or, where there is much nervous irritability of the stomach, with morphia and hydrocyanic acid, in the manner before mentioned. The chief indications for its use in this state are, pain or uneasiness at the stomach after taking food, together with a sense of load at the epigastrium, followed by acidity, and combined with a red and irritable tongue, or with one furred in the centre and red at the tip and edges.

The value of opium will be further treated of in relation to some of the special forms of the disorder.

In other cases of longer standing, more direct astringents are serviceable. The most useful of this class are the nitrate or oxide of silver, the former of which should be given in the solid form in doses of a quarter of a grain to one grain combined with opium, the latter in doses of one grain to two grains; the oxide of zinc, in doses of two grains to three grains; alum in solution, in doses of two grains to five grains; tannin or decoction of oak bark; and matico.

Arsenic in minute doses has been recommended by some writers as a valuable remedy. I have tried it in some cases, but hitherto without success: and we have not as yet obtained any definite indications for those in which it is likely to prove suitable;

while it certainly aggravates the affection in cases for which it is not adapted.

The mineral acids are very useful, when given with meals, as aids to digestion, particularly when the atonic condition is also present. It is only in marked forms of irritation that their use is contraindicated. Their utility is sometimes considerable in the dyspepsia of phthisis, as pointed out by Trousseau,¹ though in this form, when the irritability of the stomach is very marked, sedatives and alkalies often succeed better—or at least until the acuter degree of the affection has subsided. They are also often of peculiar advantage in cases of irritative dyspepsia associated with deposits of oxalate of lime in the urine, and they are occasionally of service when the urine is phosphatic; but their influence in relieving either of these conditions depends on their power of improving the digestion, rather than on any effect produced by them on the composition of the urine, on the reaction of which they have very little direct influence.

Antacids and absorbents, administered between the periods of food, are useful when flatulence or acidity is present. Where the former predominates, magnesia suspended in equal parts of infusion of rhubarb and aq. menth. pip. often gives relief. Where heartburn alone is present, a scruple to half a drachm of the bicarbonate of potassa or soda may be taken dissolved in half a tumbler of water; and this treatment is sometimes beneficial when there has been a feeling of load and uneasiness three or four hours after a meal, accompanied with great physical languor and intellectual depression: the same advantage may be obtained by drinking a tumbler of Vichy water between the meals, and also on retiring to rest at night.² They are further useful when urates or uric acid appear in the urine, and particularly in the acid dyspepsia of gouty cases. Caution, however, is required in order that the habit of taking these substances does not become confirmed, as more permanent injury to the digestion may result from their prolonged use.

Pepsine is also often of value in this disorder. I have found it especially so in the dyspepsia of scrofulous children, when the tongue is red and irritable; but I have employed it also under other circumstances with great utility.

¹ *Traité de Thérap.*, i. 206. *Clin. Méd.*, ii. 1862, p. 337.

² Whytt (Works, p. 664) recommended, for persons troubled with mucous vomiting, a tumblerful of lime-water, to be drunk on an empty stomach in the morning.

Purgatives are only to be employed with caution, and cases of chronic irritative dyspepsia are often aggravated by a persistence in their use. In children especially, their frequent employment, and particularly that of mercurial "alteratives," is very undesirable.¹ Nor are these remedies indicated by the occurrence of pale, yeasty stools, which proceed as often from imperfect gastric digestion as from disordered "liver."

In some cases of long-standing irritative dyspepsia, arising chiefly from excess in eating, benefit often accrues from free purgation with mercurials, and in gouty patients of this class colchicum may sometimes be advantageously added. Podophyllin is also of use in these circumstances.

Mercurial purgatives are also of use in cases of congestion of the stomach arising from disorder of the liver, even when this is so severe as to give rise to hæmatemesis or melæna.² They have also favourable effects in some cases of this class when pain is present, associated with the vomiting of ropy mucus,³ though in these the subsequent administration of astringents is necessary to complete a cure.

Cases occasionally occur when a severe and long-continued inflammatory condition of the stomach, which has resisted all other remedies and also a careful dietetic regimen, yields promptly to a mild mercurial course sufficient to touch the gums; after which, medicines that had previously been unavailing have proved beneficial.⁴ The same method has been followed by the author with success in cases when there was a suspicion of a syphilitic origin of the disorder of the stomach.⁵

Habitual constipation may be relieved by two or three grains of the pil. alôes co. taken with food, which may sometimes be advantageously combined with the extract of nux vomica; or by two or

¹ "And with reference to mercury, I would advise you to have your gray-powder bottles marked '*Dangerous, especially in alterative doses.*'" (Sir W. Jenner, Lectures on Rickets, *Med Times and Gazette*, 1860, p. 446.)

² These are the cases in which purgatives prove efficacious in the relief of this symptom (Sir T. Watson, loc. cit. ii. 435); but great care is necessary in the diagnosis, as they aggravate those in which the hemorrhage proceeds from ulcer or cancer. In some instances, however, the hemorrhage from congestion may be sufficiently severe to threaten life, under which circumstances the ordinary means for checking the flow must be resorted to.

³ Barlow, art. "Gastrodynia," *Cyc. Pract. Med.* iii.

⁴ This plan, laid down by Dr. Hunt (Heartburn and Indigestion, p. 73 et seq.), has been illustrated by some cases of Dr. H. Jones.

⁵ See also Trousseau, *Traité de Thérap.*, i. 269; Andral, *Clin. Méd.*, ii. p. 201 et seq.

three drachms of the decoct. aloës comp. taken before rising in the morning. When piles exist, the action of the bowels may be procured by the use of the Püllna or Friedrichshaller waters, or by a few drachms of the potassio-tartrate of soda, taken before breakfast. Castor oil also proves an excellent laxative in such cases; but the use of all these remedies should be avoided as far as possible, and the action of the bowels should be solicited by the daily use of enemata of cold water.

The employment of belladonna in doses of one-tenth to half a grain, as recommended by Trousseau,¹ also proves occasionally beneficial.

Many of the natural mineral waters have a very decided beneficial effect in restoring a healthy condition of the functions of the alimentary canal when suffering under chronic catarrhal affections. The most valuable in this respect in our own country are those of Harrogate, Bath, and Leamington. The waters of Carlsbad and Marienbad are also valuable in these complaints—the former being most useful when there is much portal congestion, and the latter when the disorder depends more on simple irritation of the gastrointestinal canal, and also in young persons who suffer from constipation.² The mineral waters of Kissingen, containing a large proportion of iron, are also of service when general atony or anæmia is combined with the irritative state of the mucous membrane. Those of Vichy are of great general utility as alkaline remedies, and are also specially applicable to dyspepsias of gouty origin; and though their efficacy is less explicable, the springs of Pouges, Plombières, and Bagnères de Bigorre have obtained a high reputation.³

The condition arising from the abuse of alcoholic stimulants requires certain modifications of the plans above indicated. Occasional mercurial purgatives prove most undoubtedly beneficial; but when there is much irritability of the stomach or vomiting of mucus, opium⁴ has a special value. Its action may often be assisted by its combination with astringents, and particularly with the compound kino powder. Its beneficial effect appears to be of a two-fold character: locally it allays the irritation of the stomach, and

¹ Clin. Méd., ii. p. 381.

² Oppolzer, Zeits. Gesellsch. Aerzte zu Wien. Canstatt, 1857, iii. 175.

³ Trousseau, Clin. Méd., ii. 379.

⁴ Andral, Prec. Anat. Path., ii. 204; Budd, Dis. of Stomach.

checks the excessive mucous secretion; while, by tranquillizing the nervous system and procuring sleep, it restores the tone of the digestive organs, and frequently enables the patient to digest solid food. Opium is also of use in cases of subacute inflammatory action, combined with great nervous irritability, and where atony also exists; it may often be given with advantage combined with nitrate of silver, as before recommended.

The simple bitters may be used in those cases where the acuter symptoms have subsided. Strychnia, or *nux vomica*, combined with the mineral acids, or the oxide of zinc, are also remedies which are specially applicable to the state of combined disturbance of the nervous system and of the digestive functions which these cases exhibit.

The disturbance of the digestive organs associated with albuminuria is often greatly relieved by free purgation and the compound jalap powder as pointed out by Dr. Budd.¹ The vomiting is, according to the author's experience of the disease, more effectually checked by ice than by any other remedy. In these cases an animal diet often suits better than a vegetable, and large quantities of slightly underdone meat may sometimes be taken with considerable advantage. Creasote, as recommended by Rayer,² as a means of checking vomiting from this source, is sometimes also useful; but its efficacy is somewhat uncertain.

The irritative dyspepsia of phthisis offers greater difficulties to a complete cure than almost any other of the forms of this disorder. One essential point to be borne in mind with regard to it is the necessity of chiefly employing sedative remedies; and of these I have found none so efficacious as hydrocyanic acid, the value of which remedy is, I believe, more marked in this disorder than in almost any other form of dyspepsia. It may be most usefully combined with the carbonates of potassa or soda, and given, in combination with infusion of calumba, twice or three times daily, in the intervals of meals.

Bismuth may also be employed with advantage, especially when there is diarrhœa, under which circumstances its combination with opium or morphia is indicated.

Another form which requires great care both in treatment and diet is the dyspepsia of scrofulous children, both of those in whom

¹ Loc. cit., p. 248.

² Mal. des Reins, li. 347.

the tongue is red and irritable, the complexion sallow, the spirits uneven, the general strength deficient, as shown by frequent complaints of lassitude, the appetite irregular and often voracious, but not unfrequently perverted, and the bowels irregular (the motions being sometimes loose and pultaceous, and at others scanty and confined, but generally pale and offensive), and who often complain much of thirst—and also of those of relaxed and atonic constitutions, in whom the external signs of scrofula are not well marked. This caution applies especially to the use of purgatives, and particularly to mercurials, which seldom fail to aggravate the condition.

The first and most essential point to be attended to in such cases is the regulation of the diet, both as to quality and quantity: *all* indigestible substances are to be carefully eschewed, and the amount of animal food is to be strictly limited until marked improvement in the digestion has taken place. In carrying out this system the physician will often have to encounter no little difficulty from the friends of his patient, who, seeing the loss of flesh and strength, not unfrequently endeavour to remedy the weakness by increased food, wine, and tonics—a plan which unfailingly tends to aggravate the symptoms, whilst an opposite procedure, during a limited period, is often productive of the best results. I have known the most obstinate irritative dyspepsias of this nature cured under a system of diet from which, during nine weeks, animal food has been almost entirely excluded, and the patient restricted to the use of light farinaceous puddings and bread and milk. Great care is necessary also in insuring the due mastication of food; and when children have acquired the habit of performing this imperfectly, they often require to be carefully watched during some weeks, until it has been overcome. Animal food may in such cases often be advantageously minced; but it must be remembered that the necessity of mastication is equally to be insisted on with all the food taken.

Mercurial purgatives are contra-indicated, and constipation is to be met by small doses of rhubarb and soda, or by castor or olive oil. A few stewed prunes may often be advantageously allowed with the meals; but other fruits, with the exception of strawberries, are, as a rule, to be avoided. The use of vegetables is only to be very cautiously permitted; and in severe cases they are to be forbidden.

As long as marked irritation persists, it is desirable to continue the use of sedatives, and of these bismuth is the most efficacious; but small doses of the carbonated alkalies, with one or two drops of dilute hydrocyanic acid combined with infusion of calumba, may be given.

The condition of atony which underlies these cases is best treated by pepsine and iron; the latter should be given in the neutral form or combined with alkalies; and when the stomach permits of its use, the administration of cod-liver oil is often markedly beneficial. General hygienic measures are also carefully to be observed, and particularly the use of warm clothing.¹ Attention must also be paid to sufficient but not excessive exercise in the open air, and good ventilation of the day and sleeping apartments. Cold or sea bathing must be regulated by the vigor of the reaction of the skin. Sponging with salt and water is sometimes advisable.

The warm bath, on the other hand, is frequently beneficial when the stomach is irritable, and particularly so in children of gouty or rheumatic parents.

A very important point to be recollected in these cases is that they are liable to frequent relapses, and that under such circumstances a return for a few days to a restricted diet and a sedative treatment becomes absolutely necessary.

The weakened state of the digestion, which often remains long after signs of irritation have disappeared, requires the cautions respecting the treatment of such cases given in the chapter on Atonic Dyspepsia. The amount of food taken should be regulated by the digestive power of the stomach. It is, however, very difficult to prevent patients in this condition from eating more than their stomachs can digest, under the erroneous idea of thereby regaining health and strength: it is not uncommon to find feeble subjects of irritative dyspepsia using very little exercise, and taking meat three times daily, together with a considerable quantity of stimulant, and with beef-tea once or twice in the intervals, who improve at once and rapidly on submitting to a more restricted diet. The just medium in these cases is at all times one difficult to attain, but the effects of a certain degree of abstinence are often most beneficial, and it is rarely that it is carried too far, at least in comparison with excesses in the opposite direction. Stimulants

¹ The exposure of young children of delicate constitutions to cold, by imperfect clothing, in the manner so commonly practised, cannot be too strongly reprobated.

should only be taken in great moderation, and of these the drier varieties of sherry, or claret, or Chablis, should be preferred.

The advantages of moderate exercise, and of change of air and scene, cannot be too strongly insisted on, and are often productive of the happiest results. One very important point to be attended to is that patients should always wear flannel, and be sufficiently clothed to protect them against the effects of change of temperature, to which they are peculiarly liable; and the general regimen of atonic dyspepsia should be most carefully observed.

V.

CHRONIC ULCER OF THE STOMACH AND DUODENUM.

SYNONYMS.—*Perforating Ulcer* (Rokitanski); *Simple Ulcer* (Cruveilhier); *Round Ulcer*; *Corrosive Ulcer* (Müller); *Ulcer of Stomach* (Brinton).

DEFINITION.—A disease characterized during life by pain in the stomach, and usually associated with vomiting, hemorrhage, and disturbances of the digestion, and terminating either in cure, or in death by hemorrhage, perforation, or marasmus. Its essential anatomical character consists in a circumscribed loss of substance of the coats of the stomach or intestine, extending for a variable depth through their tissues, which is sometimes associated with inflammatory thickening of its margins, but is not attended by any other morbid growth.

It is probable that a large number of the cases described by the earlier writers under the titles of Cardialgia, Gastrodynia, Hæmatemesis, and Melæna were really referable to this disorder. Ulcerations of the stomach were indeed recognized by Celsus,¹ and mentioned in several places by Morgagni,² but their effects were confounded by other writers with rupture, either spontaneous or from violence; or they were described among the appearances pro-

¹ De Med., liv. cap. 5.

² Epist. lxxv. 3, xxix. 14, 20, lxxix. 3 (Ulcerations of Stomach and Duodenum from Arsenic).

duced by chronic gastritis or duodenitis (Audral, Broussais, Abercrombie). The first authors who distinctly traced the connection of the special symptoms characterizing this disease with a definite anatomical alteration were Cruveilhier and Rokitsanski, who gave complete descriptions of its leading features, which have since sufficed for the basis both of diagnosis and treatment. Subsequent additions have been made to our knowledge of its pathology and etiology by Prof. Virchow and by Dr. Brinton, the latter of whom has given statistics based on a wider comparison of the published cases than had previously been attempted; and the same course has been followed by other writers mentioned below.¹

ETIOLOGY.—Frequency of occurrence. The largest data on which an estimate can be formed of the proportionate number of cases in which this disease occurs are to be drawn from the returns of Jaksch, Dittrich, and Willigk, from the hospital at Prague, who in a total of 10,203 bodies examined, found 124 open ulcers and 224 cicatrices in the stomach and duodenum;² representing a frequency

¹ The principal literature of this subject is to be found in the following works: Baillie, *Morbid Anatomy*; Hope, *Morbid Anatomy*; Cruveilhier, *Revue Médicale*, 1838; *Archives Générales de Méd.*, 1856; and *Path. Anat. du Corps Humain*, liv. xx., xxvii., xxx. Rokitsanski, *Med. Jahrbücher des Oesterreichischen Staates*, 1839, and *Path. Anat.*, Albers, *Beobachtungen*. Reports by Jaksch, Willigk, Dittrich, and Duchek, of clinical and post-mortem observations in the Prager Viertel-Jahreschrift, vols. iii., vii., viii., ix., xii., xlii., xlv., xxxviii., xlv., 1, 11.; Langston Parker, *Stomach and its Morbid States*, 1838; Williamson, *Dublin Journal*, 1841; Crisp, *On Perforation of Stomach*, *Lancet*, Aug. 5, 1843; Osborne, *Dublin Journal*, 1845; Virchow, *Archiv Path. Anat.*, 1854, and *Path. and Clin. Obs. respecting Morbid Conditions of the Stomach*, 1855; Budd, *Lectures on Diseases of the Stomach*, 1855; Brinton, *British and Foreign Med.-Chir. Rev.*, xvii. 1856; *Ulcer of Stomach*, 1857; Habershon, *Obs. on Alimentary Canal*, 1857; Luton, *Rec. des Travaux de la Soc. Méd. d'Obs.*, 1858, vol. i.; Müller, *Das corrosive Geschwür im Magen und Darmkanal*. The two last-named authors give a full historical account of the literature of this disease. A synopsis of the literature and valuable critical observations on the etiology of the disorder are also to be found in an article by Miquel in the *Hannoversche Zeitsch. für praktische Heilkunde*, 1864. For description of duodenal ulcers see Budd, *loc. cit.*; Mayer, *Krankheiten des Zwölffinger-Darms*, 1844; and for wider statistical observations see Trier, *Ulcus Corrosivum Duodeni*, reprinted from the "*Ugeskrift für Læger*," Copenhagen, of which an abstract is given in the *British and Foreign Med.-Chir. Rev.*, Jan. 1854, and in the *Prager Viertel-Jahresch.*, vol. lxxxv.; also Krauss, "*Das perforierende Geschwür in Duodenum*," 1865. For the origin of this latter disorder, in connection with burns of the skin, see Curling, *Med.-Chir. Trans.*, xxv.; Erichsen, *Lond. Med. Gaz.*, 1843; see also Abercrombie, *Diseases of Abdominal Viscera*; Bennett's *Clinical Medicine*; Hensch, *Klinik der Unterleibs-Krankheiten*, and Bamberger, *Krank. des chylipoetischen System*, Virchow's *Handbuch der Spec. Path. Therap.*, vol. vi. For some of the references to the less accessible cases, especially in the German medical journals, the author is especially indebted to the works of Müller, Miquel, and Krauss.

² Dittrich's cases, I believe, include duodenal ulcers. He distinctly mentions one such, but in most of his returns the site of the ulcers is not mentioned.

of 3.4 per cent., a result which corresponds tolerably closely with those of Dr. King Chambers and Dr. Brinton.

The returns of Dahlerup,¹ from the hospital of Copenhagen, present a marked contrast to those just quoted: in 200 bodies he found 20 open ulcers and 6 cicatrices, giving a percentage of 13 to the total number of deaths. It is doubtful whether the marked discrepancy between this observation and that of other authorities is explicable by the small number of post-mortem examinations on which it is based, or by special circumstances affecting the population.

Age.—Dr. Brinton's return of 226 cases of ulcers and cicatrices, collectively, in which the age is mentioned, show a gradually increasing frequency of occurrence with advancing years:—

Between ages of	0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90
No. of Ulcers	2	18	45	39	38	32	32	15	5
		65		77		84			

and allowing for the number of all persons living at these ages, the apparent preponderance of the disease in the later periods of life is very considerable.²

The disease is rarely met with in the earlier periods of life; but a doubtful case is recorded in a newly-born infant,³ another instance is mentioned by Barrière,⁴ in which an ulcer was formed in the duodenum in a child of six years old. Dr. Budd⁵ has met with it in a girl *ætat.* 14½, and Dr. Brinton⁶ and Dr. Buzzard⁷ have found it at the ages of 8 and 9.

Other returns, though based on smaller numbers, show that there is a preponderating liability to the disease between the ages of 15 and 30.

¹ *De Ulcere Ventriculi Perforante*; Havnia, 1841. Canstatt's and Eisenmann's Journal, 1842. The original of this work appears to have been inaccessible to most of the writers who have quoted it, as it has also been to myself.

² There are, however, two fallacies in such an estimate: for in the first place the appearance of the cicatrix gives no information at what age the ulcer from which it may have resulted has occurred; secondly, the duration of life, in many cases even of open ulcer, is often very considerable, and therefore the discovery of either lesion at an advanced age affords no certain criterion of the date of its origin. That the ulcers may, however, frequently commence at an advanced age, is seen by a case of Cruveilhier's, *Path. Anat.*, *Liv. xx.*, and also by several recorded by Dr. Brinton (*Ulcer of Stomach*, Appendix).

³ Busch, *Hufeland's Journal*, 1836.

⁴ *Malad. de l'Enfance*, *ii.* 1, quoted by Hensch, *ii.* 130.

⁵ *Loc. cit.*, 115.

⁶ *Loc. cit.*, 33.

⁷ *Path. Soc. Trans.*, *xii.* 84. All the three last-named cases had perforated.

Thus a comparison of the tables of 108 fatal and open ulcers given by Willigk and Miquel affords the following results:—

Age.	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Total.
Ulcers—Males . . .	2	9	6	8	5	2	1	33
“ Females . . .	13	21	9	15	6	8	3	75
Total . . .	15	30	15	23	11	10	4	108

And of 21 not fatal, by Duchek, the ages in which they occurred were:—

Age	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Ulcers	3	6	7	4	1

Dr. Crisp, of 51 cases of perforation, of which 39 occurred in females and 12 in males, gives as the ages of the former:—

Age	15 to 20	20 to 25	25 to 30	30 to 60
Ulcers	21	10	5	3

Sex.—The disease appears, from the returns of numerous observers, to be between twice and three times as frequent in the female as in the male sex.

The sex of the patient appears also to exercise an influence not only on the age at which the ulcer appears, but also on that at which one of its most fatal accidents, viz. perforation, occurs, and probably in some degree on the special liability to this event. Thus by comparison of the tables of open and fatal ulcers given by Willigk¹ and Miquel it will be seen that, in the male sex, only one-third occurred before the age of 30 (11 to 22), while of the females the proportion of cases occurring within this period to those observed at all other ages was as 34 to 41. The greater liability to perforation at early ages in the female sex is apparent from Crisp's tables, and also from a large number collected by Dr. Brinton. These show that nearly three-fourths of the instances of this event in the female sex occurred before the age of 35, while in the male sex the cases of perforation are nearly equally divided among all ages, though somewhat diminishing in frequency after that of 50 had been attained.

The absolute liability to perforation in the two sexes is a matter of some uncertainty. Dr. Brinton estimated it as about correspond-

¹ In Willigk's cases the whole number of females examined exceeded that of the males, being 3440 of the former to 2766 of the latter.

ing to the absolute proportionate frequency of ulcerations observed,¹ but other authorities believe that there is a greater relative frequency among females.²

Of the influence of race and climate but little is known. But few positive facts are known regarding any influence exerted by occupation, though Dr. Copland asserts that, when occurring in the female sex, it is most common in those engaged in needlework or in domestic service.³ There is a general impression that this disease is most common among the poorer classes, but no certain data exist for this opinion.

Among other occasional causes which have been mentioned, are moral emotions,⁴ bad or insufficient food, excessive indulgence in spirituous drinks,⁵ and exposure to extreme cold.⁶ *Corrosive poisons*, and particularly the mineral acids, may also give rise to perforating ulcer:⁷ their *modus operandi* will be easily understood when the pathology of the disease is considered.

There are certain *diseases* to which a direct causative influence has been ascribed in the production of the complaint, and which deserve a passing notice.

Amenorrhœa is perhaps the one which holds the most important rank among these, but precise information is wanting regarding the exact relation of the two disorders. It appears to be pretty

¹ Dr. Brinton's estimate of the relative frequency of ulcer in the two sexes gives a smaller preponderance to the female sex than do the numbers collected by other observers.

² In 221 cases of ulcer by Willigk there were six perforations, all in the female sex; of sixty-seven cases of perforation by Miquel, fifty-one were females; while Dr. Crisp's tables, before quoted, give a proportion of thirty-nine females to twelve males.

³ Med. Diet., iii. pt. 2. 919.

⁴ See a case by Cruveilhier, Path. Anat., Liv. xx. Osborne also says that he has known the symptoms of ulceration to date from this cause; Dub. Med. Journ., xxxvii. p. 357.

⁵ Leudet, Congrès Méd. de France, 1868, 104. In twenty-six cases of drunkards, Leudet found eight cases of ulcer, open or cicatrized. He calculates that one-third of the whole number of ulcers found by him were associated with habits of intoxication. See also Kolb, Bericht über die Wiener Sammlung (Canstatt's Jahreshb., 1850, quoted by Leudet); also Huss, Alcoholismus Chronicus, p. 5. Leudet further gives cases where hæmatemesis followed the drinking of large quantities of alcohol.

⁶ A case by Förster, Wurz. Med. Zeitsch., 1864, ii. 164. The etiology of this case is doubtful. The patient had been exposed to great cold, and drank a large quantity of raw spirits. There was perforation of the posterior wall of the duodenum with an abscess in the retro-peritoneal tissue. Förster thought it possible that the spirits might have produced an excessive secretion of gastric juice leading to the perforation.

⁷ See a case of perforating ulcer of the stomach caused by swallowing hydrochloric acid, related by the author, Path. Soc. Trans., xix. 239.

certainly established that, though menstruation is sometimes regularly maintained after ulceration, especially in middle-aged females (Brinton), yet that disturbances in this function accompany ulcers of the stomach with a greater proportionate frequency than is met with in almost any other class of disorders, except perhaps tuberculosis. We possess, however, no certain information as to the number of instances in which suppression or arrest of the menstrual flow has preceded the disease of the stomach. Cases are indeed recorded in which suppression of the menses, through cold, in previously healthy females has been immediately followed by symptoms of ulceration; and in some, even after the re-establishment of the menstrual function, the symptoms of the disease of stomach recurred with each return of the uterine discharge.¹ The age at which the disease is found with such frequency in the female sex appears to point in a very distinct manner to the influence of puberty on its occurrence, and Miquel² states that he has observed a similar though less marked liability at the climacteric period between the ages of 40 and 50. These facts, together with the evidence afforded by Crisp³ of the association of amenorrhœa with the liability to perforation, would tend to show that the connection between the two conditions is something more than accidental, and that, as will be further considered when the pathology of the disorder is discussed, these disturbances, when preceding the appearance of the ulcer, may be reasonably supposed to have a direct influence on its origin.

The influence exerted by the states of anæmia or chlorosis on the occurrence of ulceration is less evident. They have been very frequently observed in cases of perforation,⁴ which, under these circumstances, may in part be due to the absence of sufficient vitality to allow of the projective thickening of the edges and base of the ulcer, by which this accident is commonly prevented. It is stated, however, by Miquel, that a sound condition of health has often in the female sex immediately preceded the ulceration.

Tuberculosis is met with in a great number of cases, but, as shown by Dr. Brinton, "the percentage of tubercle in cases of gastric ulcer does not seem to exceed its average in all persons indifferently;"

¹ See Miquel, loc. cit., 145.

² Loc. cit.

³ Dr. Crisp found that, in thirty-nine cases of perforation, the state of the menstruation was not mentioned in twenty-five. In the remaining fourteen, it was present and regular, in one; irregular, or suppressed, or had never appeared, in thirteen.

⁴ Especially by Crisp.

nor do other diseases of the lung appear to exert any direct influence on its production.

The coincidence of the ulcer with the puerperal state mentioned by Chaussier has been brought into prominence by Jaksch's returns, who found that, of 91 females, it occurred in 10 during the period of child-bed. Rokitanski was of opinion that the occurrence of intermittents predisposed to the disorder, and Engel¹ says that in 10 per cent. of his cases the patients were syphilitic. Krauss says that the disease has commenced after suppression of hæmorrhoidal discharges; Miquel, after the healing of old ulcers on other parts of the body.² The association of the disorder with diseases of the liver will be alluded to in the history of its pathology.

Of the other diseases with which it is most commonly found associated may be mentioned those of the heart, though by no means exhibiting a great frequency of occurrence in proportion to the whole number of cases dying of these disorders.

Another affection which appears to act as a direct cause of these ulcers, but the effects of which are remarkable as being almost wholly confined to the duodenum, are burns of the skin. Their influence in this respect was pointed out by Cumin,³ Dupuytren,⁴ Cooper,⁵ and Long,⁶ and was more fully brought forward by a collection of cases published by Mr. Curling,⁷ and in a memoir by Mr. Erichsen.⁸ Mr. Holmes⁹ has recently given further illustrations of their comparative frequency; in 125 cases of severe burns collected by him, the duodenum was ulcerated in 16, and other portions of the intestines in 2 others. The earliest period at which the ulceration has been discovered has been on the 4th, 5th, or 6th day. The age of the patient exercises no influence on the result, nor does apparently the situation of the external injury.

MORBID ANATOMY.—It has been already stated, in the definition above given, that the essential anatomical alteration of this disease is an ulcer or ulcers of the coats of the stomach.

¹ Prager Viertel-Jahresch., vol. xl. p. 7. As, however, he does not give the whole numbers on which this calculation was founded, its relative value can scarcely be estimated. The evidence of disturbance of the stomach from a syphilitic taint does not show conclusively that the cause is due to ulceration. See Andral, Clin. Méd., ii. 201 et seq., and Höring, Schmidt's Jahrbücher, 88.

² Two cases, loc. cit., 143. See also a case quoted by Cruveilhier, Liv. xx., where the disease in the stomach commenced in a patient æt. 62, after the healing of an ulcer in the skin.

³ Edin. Med. Surg. Journ., 1823.

⁴ Lond. Med. Gaz., xxvii.

⁵ Med.-Chir. Trans., 1842, vol. xxv.

⁶ Syst. of Surgery, vol. i. p. 733 et seq.

⁷ Leq. Orales, p. 521.

⁸ Lond. Med. Gaz., Feb. 1840.

⁹ Lond. Med. Gaz., 1843, 769, 790.

The term as thus used is not, however, applied to all forms of ulceration of the mucous membrane, and it does not embrace either the superficial or the follicular erosions, which have been previously described as found in catarrhal inflammations of the organ. Nor, in the author's opinion, should the superficial hemorrhagic erosions be included in the definition of this disease, though its relation to the latter form will be again alluded to.

As distinguished from the above forms, the chronic or perforating ulcer of the stomach is one which extends for a greater depth in the tissues, sometimes passing only through the mucous membrane, at others penetrating the muscular tissue, and even the peritoneum.

(a) *Character and Appearance of Ulcer.*—It is found in two conditions, which, as they are supposed to represent either different stages or variations in its mode of progress, it seems not unimportant to distinguish from one another.

The first of these, which is believed to be that in which the ulcer is found soon after its origin, presents a sharply defined loss of substance of variable depth in the coats of the stomach; it may, then, when affecting only the mucous membrane, have a flattened appearance, with clean-cut edges, looking as if they had been punched out of the tissue; when, however, the destruction has extended more deeply, it generally presents, even at this period, an appearance somewhat resembling that of a funnel whose apex is directed towards the peritoneum.¹ The edges and floor in this stage are smooth and even, the former seldom presenting any swelling or elevation above the surrounding tissue; the base, however, often shows a softened, puffy look, and minute sloughs may sometimes be found upon it. In some cases, however, the ulcer has been found with a mass of blackened blood adhering to its base,² or with an infiltrated extravasation of blood into its margins, or surrounded by a zone of injection in which petechial extravasations have occurred—appearances which, as will be seen, are of considerable interest in relation to the pathology of this disease,

¹ This funnel-shaped opening, as has been observed by Virchow, does not always extend vertically into the tissue in its whole circumference, but one side may be vertical and the other sloping.

² Frerichs, *Dis. of Liver*, Syd. Soc. Trans. by Murchison, Case I. vol. i. p. 136; Bennett, *Clinical Medicine*, 789; Habershon, *Obs. Aliment. Canal*, 1862, p. 98; also a case quoted by Mr. Curling from Long, *Med.-Chir. Trans.*, xxv. 269; also Handfield Jones, *l.c. cit.*, 128.

and to the experiments conducted with a view to its artificial production in animals.

In this stage the ulcer frequently perforates; but the morbid anatomy of this result of the disorder will be separately described.

When the ulcer has existed for a longer period, its walls and floor undergo an inflammatory thickening, through which its funnel-like shape becomes more distinct, and it acquires a stratified and crater-like appearance, which is less distinct in its earlier stages. This appearance is due to the different coats being involved in areas which progressively diminish from within outwards, the mucous and submucous tissues being destroyed over a wider surface than the muscular, which thus forms the first step, and through the opening in which the thickened peritoneal and sub-peritoneal tissues are seen penetrated in a smaller extent by the progress of this disease.

The whole tissue of the wall is thickened around the ulcer, and the different coats become blended together, sometimes for a considerable distance around its margin. The new tissue by which this is effected consists of an amorphous or finely granular intercellular substance, in which are imbedded nuclei more or less thickly scattered. At a later period it is developed into an imperfectly fibrillated tissue. Occasionally, but not commonly, granulations may be seen on the sides and base of the ulcer.

The tubular glands in the immediate neighbourhood are sometimes destroyed by this growth, or villous or polypoid vegetations may be developed on the mucous surface surrounding the ulcer; but in the majority of cases these appearances are not observed, and the ulcer exists only as a conical-shaped perforation of the coats of the stomach, surrounded by a thickened and indurated cicatricial margin, and resting on a base having the same characters. In rarer instances the ulcer has been found associated with suppuration in the coats of the stomach, leading to secondary thrombosis and suppuration in the portal vein.¹

In some cases the retraction of the deeper layers may give the mucous membrane an excavated appearance, and this may proceed to the extent of causing the edges of the mucous membrane to meet in the centre (Krauss); but, ordinarily, when cicatrization ensues, it proceeds by granulations from the base, and the

¹ Dr. Bristowe, Path. Soc. Trans., ix. 275.

previous site of the ulcer is marked by a cicatrix of variable size, uncovered by mucous membrane, and surrounded by stellate, radiating lines extending into the surrounding tissue.

(b) *The size* of these ulcers varies from that of a fourpenny-piece to a diameter of five or six inches.¹ The larger diameters mentioned have been almost entirely met with in cases where there was reason to believe that the disease had been of long standing; and those of more recent formation, or which have run an acute course, have seldom exceeded that of a shilling or half-a-crown. Perforating ulcers have been artificially produced² not larger than a pin's head in diameter.

(c) *The shape* of the ulcer is usually round or ovoid. Coalescence of one or more may give, however, various irregularities of outline; and instances are recorded in which they have been found surrounding the whole circumference of the pylorus.

(d) *The number* met with in any single subject varies.

Dr. Brinton says that, out of 536 cases, two or more were present in 113, or in 21 per cent.³ Instances, however, are mentioned in which three, four, five, or even more open ulcers have been found in the same stomach; and Krauss says that, in the cases of duodenal ulcers observed, a plurality has been found in one-third. The simultaneous occurrence of ulcers in the duodenum and in the stomach is also, comparatively speaking, a frequent event.

(e) *The seat* of the ulcer is much more commonly in the stomach than in any other portion of the intestinal canal. It is very seldom met with in the œsophagus,⁴ and is much less frequent in the duodenum⁵ than in the stomach; but instances are recorded in which similar ulcers have been discovered in the lower portions of the intestines.⁶

¹ A case is given by Law, *Dub. Hosp. Gaz.*, ii. 51, of an ulcer measuring 6 in. by 3 in., quoted by Lees (*Diseases of Stomach*).

² Müller, *loc. cit.* 273.

³ He does not, however, state whether these include cases where recent ulcers and cicatrices of older ones were present together—a very common condition.

⁴ A case of this kind is given by Mr. Flower, *Med.-Chir. Trans.*, xxxvi.

⁵ Willigk found, for 225 cases in which the stomach was affected, only 6 cases of ulcer in the duodenum; and Trier, on the other hand, gives, as the relative proportional frequency in these parts, 28 cases of duodenal ulcer, as contrasted with 261 where it was found in the stomach. It is not, however, unlikely that cicatrices in the duodenum may be frequently overlooked: so that no absolute reliance can be placed on these numbers.

⁶ Albers, *Die Darmgeschwüre*, p. 474, et seq. Lebert and Claus, *Ueber spon-tan. Darm Perforationen*, *Diss. Inaug.*, Zürich, 1856—a case where a perforating ulcer existed in the colon simultaneously with another in the stomach (quoted by

The seat of the ulcers in the stomach exercises an important influence on the progress of the disorder, and therefore deserves especial mention. The largest statistics on this subject are given by Dr. Brinton, who, in 220 cases in which the site was recorded, found that eighty-six were on the posterior surface; fifty-six on the smaller curvature; thirty-two on the pylorus; thirteen on the anterior and posterior surfaces, which frequently existed together, and were often opposite to one another; ten on the anterior surface only; five on the greater curvature; and four in the cardiac pouch. Rokitsanski's remark, that the ulcers are more commonly seated in the immediate neighbourhood of the curvatures rather than directly upon them, has been fully confirmed by more extended observation.

The majority of ulcers in the duodenum are situated in the upper horizontal portion.¹

(f) *The progress* of the ulcer, when once formed, tends either to cicatrization or to extension through the coats of the organ; in the latter case leading either to perforation of the stomach or to the invasion of neighbouring organs through adhesions previously contracted.

(g) That *cicatrization* is by far the most common result is shown by the returns before quoted, where it is seen that cicatrices are found nearly twice as frequently as open ulcers.²

The process by which cicatrization is accomplished has been already described, but its final results differ considerably, according to the depth and superficial extent of the ulcer, the adhesions which it has contracted to neighbouring organs, and the amount of thickening which has taken place around its base and margin.

In many cases the process is not complete, and there is a proclivity to a return of the ulcerative action in the cicatricial tissue.

When the loss of substance has not penetrated deeply, or when

Krauss); Lebert, *Handb. der Prakt. Med.*, ii. 369. Dr. Dickinson, *Trans., Path. Soc.* 1867, has recorded a case of ulceration in the colon. I have seen two cases where intermitting hemorrhage from the colon rendered the diagnosis of ulcers in this part of the bowel extremely probable. Both were in females. Cases, where large alterations in the intestines resulted from embolism, are given by Panum, *Virch. Archiv*, xxv. See also on this subject, Mr. Holmes's article, before quoted.

¹ Of 47 cases collected by Krauss, only 2 were situated in the lower horizontal part.

² Dr. Brinton, from a smaller number of cases, deduced that open ulcers and cicatrices are met with in about equal frequency. The result of the larger returns points to an interesting fact as regards the curability of the disease, which will be the subject of further remark.

cure has followed rapidly on the destruction,¹ the site of the injury is only marked by a white spot in the mucous membrane, attended with little or no puckering or contraction; but in other cases a similar appearance, with radiating, stellate lines proceeding from it, may be seen externally on the peritoneal covering.

In cases, however, where the ulcer has extended deeply, and where there has been great thickening of its base and margin, the contraction of the fibrous tissue, by which the loss of substance is replaced, may lead to alterations in the form and shape of the stomach. Amongst the most remarkable of these are cases when, from ulcers seated in the smaller curvature, the pyloric and cardiac orifices have been drawn into close proximity to one another;² or where the constriction extending round the centre of the stomach has given it an hour-glass shape, involving a special tendency to dilatation of the fundus;³ or where the whole organ may have been found reduced to the size of the intestine.⁴ Strictures also of the orifices are by no means uncommon, though much more frequent in the pyloric than in the cardiac extremity.⁵ Extreme degrees of stenosis are rare (only about once in 200 cases—Brinton). When affecting the pyloric orifice, they are usually attended with extreme distension of the whole viscus, and are associated sometimes with thinning, and at others with thickening, of its muscular coats, while in a third class this dilatation is limited to peculiar pouch-like formations in the pyloric portion.⁶

Similar constrictions have also been observed in cases where cicatrization has ensued in ulcers situated in the duodenum, the effects of which on the stomach are very similar to those produced by narrowing of the pyloric orifice. Sometimes, however, dilatations, for which an explanation is not easily afforded, have been seen immediately beyond and below the constricted part (Krauss).

¹ Mr. Curling has given a case where cicatrization of an ulcer in the duodenum after a burn was found commencing on the tenth day; another when it was completed at the eighth week; and Mr. Holmes has recorded one where cicatrization in the duodenum was completed within twenty-eight days after the burn from which it had probably originated.

² As in a case by Barnhoff, quoted by Henoch, *loc. cit.* 143, where the pyloric and cardiac orifices were only $1\frac{1}{4}$ inches distant.

³ In cases by Cruveilhier, Budd, and Brinton.

⁴ For a case of constriction of the cardiac orifice, with great consequent diminution of the size of the stomach, see Drasche, *Wien. Med. Wochens.*, 1854, No. 67 (Müller).

⁵ Jaksch, *loc. cit.*

⁶ See two cases by Cruveilhier, *Anat. Path.*, *Liv. liv. xx.* Also a case quoted by Brinton, *Dub. Med. Journ.*, ii. 494.

The contractions may also lead to peculiar bending and twisting of the intestine, and in one case, recorded by Frerichs,¹ to further consequences due to the thickening of the tissues external to the bowel, resulting in complete obliteration of the vena portæ.

The contractions of the cicatricial tissue, and the change thence resulting, are, however, not always necessarily attended with closure of the ulcer, which in some of the cases just quoted has still been found open.²

(h) *The extension of the ulcer* proceeds either by the destruction of the cicatricial tissue in its base and margins, or it may occur before this product has been formed. In the former case it is characterized by softening and liquefaction of the superficial layers of the base, while at the edges, where it is taking place, the thickened mass disappears, and the border presents the same sharply-cut limitation which characterized the first stage of the disease. In some instances this may be found affecting only part of the circumference, and thus affording a criterion of a return of the destructive process in an ulcer of old standing.

During its progress the larger vessels of the stomach are not unfrequently opened, and prove one of the sources of the hemorrhage so frequently observed.

The rapid extension of an ulcer in the early stages of its formation is one of the most frequent causes of the accidents next to be considered.

(i) *Perforations* of all the coats of the stomach may be divided into two classes—namely, those in which an opening has ensued from its interior into the abdominal cavity, and those in which this event is prevented by adhesion to the surrounding viscera. The frequency with which the first-named of these events occurs has been calculated by Dr. Brinton, from 257 recorded cases of open ulcer, as being about equal to $13\frac{1}{2}$ per cent. of all cases of ulceration; but, as this average is based upon an estimate of the comparative frequency of cicatrization, which there is reason to believe is considerably below that really found, so it is not improbable that the actual proportion of the cases in which this accident occurs is less than Dr. Brinton was disposed to believe;³ though, as Cru-

¹ Dis. of Liver, Syd. Soc. Trans., i. 272.

² See also a case of contraction of the duodenum by a recent ulcer, Duchek, Prag. Viertel-Jahresch., xxxvii. 51, 1853.

³ Of Willigk's 231 cases of ulcers and cicatrices, as before quoted, only six had perforated; and Dittrich in 106 cases only met with ten cases of perforation. It

veilhier has pointed out, it is much more frequent in cases of simple ulceration than in those of cancer of the stomach.

The influence exerted by age and sex on this event, having been already alluded to, does not appear to require further discussion. A very important feature in determining the character and nature of this result is to be found in the position of the ulcer itself in the wall of the stomach and duodenum. When this is situated in parts where the amount of movement and distension is the least, and where adhesions are most easily formed to surrounding parts, the probability of the accident is considerably less as compared with the cases where opposite conditions prevail;¹ and thus ulcers situated in the anterior wall of the stomach and on the lesser curvature are more liable to perforation than those in the posterior wall and greater curvature; while, of the duodenal ulcers,² those situated in proximity to the head of the pancreas possess almost an immunity from this event.

Precise figures regarding the condition of the ulcer at the time of perforation are wanting; but, though the event is very frequent in those of old standing, there yet seems reason to believe that it is comparatively more so in the early stages of the disease, and before the protective thickening which subsequently ensues has had time to form. It seems not impossible that the depth to which the tissues are primarily affected by the process which gives rise to the slough, in which the ulcer often appears to originate, has no small influence in accelerating or retarding this event.

When it occurs in those of recent origin, or when there are no adhesions to neighbouring organs, the peritoneal covering gives way after the previous formation of an ashy-gray slough, the final

is probable, also, as Miquel has observed, that in collections of isolated cases a greater number of instances of perforation will be found, owing to the remarkable character of the event conducing to its publication, while those of simple ulcer are not so commonly thought worthy of being recorded.

¹ Of 191 cases of perforation of the stomach by ulcers collected by Dr. Brinton, 69 were on the lesser curvature, 55 on the anterior surface, 11 on the posterior surface, 9 at the pyloric extremity, 10 at the cardiac end, 4 in the middle of the organ, and "in no less than 24 there were two ulcers opposite one another on the anterior and posterior surfaces of the organ—the former being the site of the perforation, while the latter was in most instances firmly adherent to the pancreas." It is interesting to compare these returns with those of Jakseh relative to the comparative frequency of the sites of adhesion. These occurred in 22 out of 57 cases of ulcer, and in 15 they were between the posterior surface or lesser curvature of the stomach and the pancreas; in 5 between the pyloric portion or lesser curvature and the liver; while in one only there was adhesion to the mesentery, and, in one, to the spleen.

² Krauss states that, of 16 cases of perforation of the duodenum from this cause, in 12 the event had occurred in ulcers situated in the right wall of the upper horizontal portion.

yielding of which is generally determined by distension of the stomach, or by the effort of vomiting. The external opening is usually considerably smaller than the inner surface of the ulcer; its edges are generally sharp and well defined, like those of the rest of the ulcer, but sometimes they may be slightly ragged from the final rupture of the necrotized tissue. They are never, however, so ragged and thinned, nor do they present the same pulpy and transparent appearance as is seen in the case of perforation by post-mortem solution, from which the perforation is further distinguished by the characters of the alteration of the mucous membrane in the latter.¹

When adhesions have formed to neighbouring organs, or when protective thickening has occurred in the sub-peritoneal tissues, the future progress of the ulcer is subject to many variations. Thus, it may deeply invade the tissue of the liver, spleen, or pancreas, giving rise to extensive hemorrhage from their vessels;² or deep fistulous openings may form into the interior of these organs, in which also, in some cases, large abscesses may be found communicating with the ulcer; while, in the case of the liver, secondary abscesses are by no means uncommon.³ In other, but rarer instances, perforations may occur in the diaphragm,⁴ and the ulcer may give rise to pleurisy or to gangrenous inflammation of the lung, or may communicate with the bronchi; or perforation may ensue into the transverse colon,⁵ or externally through the anterior wall of the abdomen.⁶ Other events which have been recorded are

¹ Cases are, however, recorded where the perforation took place, not at the seat of the ulcer, which had caused stricture of the pylorus, but from rupture of the fundus of the secondarily dilated stomach (Siebert, quoted by Müller, p. 110). A somewhat similar incident in a case of cancer of the stomach is recorded by Andral, *Clin. Méd.*, ii. 75.

² Opening of the portal vein by a duodenal ulcer has been recorded by Rayer, *Archives Gén.*, vii. 66; Andral, *Proc. Path. Anat.*, ii. 177.

³ See some cases by Dr. Murchison, *Path. Soc. Trans.*, xvii. 145.

⁴ These, however, are generally caused by fistulous communications through adhesions with other organs, or with circumscribed abscesses. See cases by Dr. Habershon, *Path. Soc. Trans.*, 1846-7, p. 252; Obs. *Alimen. Canal*, 1862, p. 82; Cruveilhier, *Arch. Gén. de Méd.*, 1856, p. 155; also by Rokitsanski and Jaksch.

⁵ See a collection of the published cases of this nature in an able memoir by Dr. Murchison, on *Gastro-Colic Fistula*, *Edin. Med. Surg. Journ.*, 1857-8. This perforation is much more frequent in cancer than in ulcer of the stomach; of 33 cases 9 or 10 only were from simple ulcer, 21 from cancer.

⁶ Dr. Murchison has collected all the cases of gastro-cutaneous fistula hitherto recorded in a memoir, *Med-Chir. Trans.*, xli. There is a striking contrast between these and gastro-colic fistula in regard to the comparative frequency with which they are connected with simple and cancerous ulceration; for whereas the number of instances in which openings into the colon are associated with cancer greatly exceeds that in which they are caused by ulcers, gastro-cutaneous fistula would appear to be nearly twice as frequently the result of simple ulcer as of

erosions of the pancreatic¹ and biliary ducts, and sometimes, in the case of duodenal ulcers, the ducts have been found either in a state of suppuration,² or obstructed, thus giving rise to jaundice,³ or even to bursting of the gall-bladder;⁴ while, in other instances, perforation of this latter structure by the ulcer has been noticed;⁵ in others the stomach has been so bent upon its axis, as to form a second direct communication with the duodenum through the adhesion and perforation of their walls thus brought into apposition, the pyloric ring remaining, in some cases, open and bridging the newly-formed aperture.⁶

(k) *Escape of the contents of the stomach into the cavity of the abdomen* is almost invariably followed by more or less general peritonitis,⁷ associated with tympanitic distension, which sometimes proceeds to an extreme degree, owing to the escape of air through the opening in the stomach or duodenum (Abercrombie).

In other cases however, where, as Dr. Brinton observes, a gradual filtering of the gastric contents has taken place through a small opening in its wall, or through incomplete adhesions, and particularly through those which are formed between the stomach and omentum, circumscribed abscesses, sometimes of considerable size, and communicating with the ulcer, may be formed. Their boundaries are then variously constituted by adhesions between the ulcer and the anterior wall of the abdomen, or with the diaphragm, liver, colon, pancreas, or spleen, which latter organs may be sometimes partially or completely destroyed; or the abscesses may be limited to the cavity of the small omentum, a variety of which Dr. Brinton

cancer. This difference is probably due in part to the comparative rarity of simple ulcer "in that part of the stomach nearest the colon, whereas of simple ulcers ending in perforation a very large proportion is found in the anterior surface." Perforations externally caused by ulcer may be distinguished usually by the smoothness of the opening, while those from cancer are ragged and villous through the extension of the growth in the skin.

¹ Rokitsanski; also Dittrich, *Prager Viertel-Jahresch.*, xiii. 124.

² Förster, *Wüzb.*, *Med. Zeitsch.* 1861, ii. 168.

³ Krauss, p. 21.

⁴ Herzfelder, *Wiener Zeitsch.*, 1846, p. 23 (Krauss).

⁵ Dr. Barker, *Lancet*, June, 1850, 776. Also Long, *loc. cit.* See also a case by Chomel (*Andral, Proc. Path. Anat.*, ii. 116), where there was a fistulous communication between the duodenum, gall-bladder, and colon.

⁶ Rokitsanski, *loc. cit.* Cruveilhier, *Rev. Méd.*, iii. 36. Dittrich, *Prag. Viertel-Jahresch.*, xiii. In the latter case the communication took place through the pancreas.

⁷ A remarkably exceptional case is recorded by Bardeleben, in which, though the patient lived twenty-four hours, and purgative medicines, together with other contents of the stomach, were found in the peritoneal cavity, there were no signs of general inflammation of its lining membrane. *Virch. Archiv*, v. 250.

has collected twenty instances. Such abscesses may be more or less permanent, but the adhesions may again give way; and this event is then followed by more general peritoneal inflammation.

In some cases where ulcers of the duodenum have opened into the loose cellular tissue bounding its posterior wall, the abscesses resulting have passed upwards through the mediastinum towards the neck,¹ or have opened outwards between the sixth and seventh rib on the right side, or, posteriorly, at the shoulder blade.²

(1) *Hemorrhages* from the ulcer require a short separate consideration.

Cruveilhier³ divided them into slight, moderate, and excessive, and pointed out that those of the two first classes came from the smaller arteries and veins of the mucous and submucous tissue, which, when examined under water, can be seen either eroded and obstructed by recent and easily detached clots, or closed by more firmly attached coagula. Copious hemorrhages may, however, sometimes be determined by venous congestion, since in some cases of this nature no other source has been found for the blood effused than varicose, dilated veins in the mucous membrane of the stomach.⁴ The tendency is increased by hyperæmia, however originating, and especially by that occurring during the digestive act. It is probably also in this latter cause that an explanation must be sought for the cases where hemorrhage has been increased or caused by moral emotions,⁵ or by the menstrual period.⁶

Larger hemorrhages most commonly arise from the perforation of vessels of considerable size in the deeper coats. This event is indeed usually prevented by the coagulation of the blood in their interior, and by the resistant character of their walls; and it is by no means uncommon to find an obstructed vessel in the floor of an ulcer, in cases where no considerable hemorrhage has taken place during life. The ulceration of the obstructed vessel, nevertheless, may proceed beyond the point to which the protective thrombosis has extended. In some cases extensive hemorrhage has

¹ Förster, Würzb. Med. Zeitsch. 1860, ff. 162 (Krauss).

² Gross, El. Path. Anat. 532. Also a case by Dr. Stretton, of Worcester, Lond. Med.-Phys. Journ., vol. ix. p. 43. In the latter instance there were openings in both the last-named situations, and food passed through the fistulous opening between the ribs five minutes after it had been taken.

³ Archives Gén. 1856.

⁴ Cruveilhier, Anat. Path., Liv. x. Also Frerichs.

⁵ *Ib.*, Liv. xx.

Ib., Lib. xx.

taken place in the early stages of ulceration, but in others the whole ulcer has been found cicatrized except at a point where an eroded artery, giving rise to fatal hemorrhage, projected into its floor.¹

Another source of both the larger and also of the smaller hemorrhages is to be found in the penetration of the vessels of adjacent organs with which the ulcer has formed adhesions, and among these the splenic artery, which in its tortuous course often comes in contact with the stomach, affords a large proportion of instances of hemorrhage. Perforations are, however, recorded of the hepatic artery from duodenal ulcer.

When, on the other hand, hemorrhage ensues from the main arteries of the stomach, it usually proceeds from those situated in the larger and smaller curvatures, and especially from the superior pyloric and coronary artery.² Moreover, as Miquel has also remarked, the presence of a large vessel at the base of an ulcer affords, by its resistance to the ulcerative process, a certain protection against the occurrence of perforation.

(*m*) *The condition of the mucous membrane* of the stomach offers also certain varieties. In many cases it is found perfectly healthy; in others, polypoid vegetations, or extravasations and hemorrhagic erosions, may be found around the margins of the ulcer; signs also of chronic or recent catarrhal inflammatory action are not unfrequent. These latter are, however, most common when constrictions have occurred in the pyloric or duodenal portions of the canal. The appearances characteristic of these changes, and also the varicose dilatation of the vessels occasionally observed, do not, however, require further description in this place.

PATHOLOGY AND PATHENOGENESIS.—While some observers attributed these ulcers to inflammation, and others, as Cruveilhier, have expressed themselves unable to explain their origin, Rokitsanski separated them from the class of ordinary inflammatory

¹ Cruveilhier, Anat. Path., Liv. x. Also Boullay, Schmidt's Jahrbücher, vol. lxx. p. 185 (Miquel).

² Hence there is a certain contrast between the liability to perforation and hemorrhage determined by the anatomical position of the disease in the walls of the stomach, since ulcers situated on the anterior surface, from which, as has been seen, perforation is most likely to ensue, rarely invade in their progress any of the larger vessels, whose branches are only sparingly distributed to this portion of the organ. Thus, of 52 cases of fatal hemorrhage collected by Dr. Brinton, the ulcer giving rise to it was in 24 instances situated in the smaller curvature, in 17 on the posterior surface, in 6 on the pyloric extremity, and in 2 only on the anterior surface.

ulcerations, and declared that their point of departure was from a necrosis of the mucous membrane and subjacent tissues. Virchow¹ advanced the next step in this direction, by stating that the primary condition for their formation was an arrest of the circulation through a sufficient depth and area to permit the solvent action of the acid gastric juice to be exerted on the tissues deprived of the protective action of the alkaline blood. This view has received a direct confirmation from Dr. Pavy's² experiments on the effects of the arrest of the circulation in the stomach, which have shown that this event is invariably followed by the solution of the coats of the organ, proceeding in some instances to complete perforation; and it is still further corroborated by the case before quoted, where hydrochloric acid swallowed had given rise to an ulcer proving fatal by a perforation of the coronary artery.³

If this opinion be admitted as affording a probable explanation of many, if not most, of these cases, it follows that any causes capable of producing such an event may be competent to give rise to the ulcer in question; and among the most frequent of these appear to be extravasations of blood into the tissues of the stomach, to which a preponderant influence in this direction was first attributed by Rokitsanski.

It appears, however, to be necessary that such extravasations should extend deeply, and occupy some considerable area, and that the minor petechial ecchymoses resulting from capillary hemorrhage on the surface, and to which the name of hemorrhagic erosions has been given, are, as a general rule, incapable of producing this effect, since the protective influence of the circulation is not, in these cases, sufficiently withdrawn, to permit the action of the gastric juice extending deeply into the subjacent tissues.

Virchow states as his opinion, that the most frequent causes of this arrest of the circulation are obstructions of the arteries through embolism, extravasations through obstructions of the portal vein, fatty degeneration of the coats of the arteries, or even the diminished calibre of the vessels, sometimes met with in chlorosis, or extravasations caused by violent movements of the stomach in the act of vomiting.

¹ See Handb. der Spec. Path. Therap., i. 256; Archiv., v. 362 et seq. Wien. Med. Woch. 1857, pp. 498, 499. Gesammelte Abhandlungen, p. 706.

² Phil. Trans. 1863. A Treatise on the Function of Digestion, 1867.

³ Note 7, page 915.

The possibility of the direct production of these ulcers through embolism has been demonstrated by Panum's experiments. The immediate effect of the obstruction of the arteries thus produced was seen in extravasations into the submucous and mucous tissues, which were followed by ulcerations in these parts, having all the characters above described;¹ and Müller² has equally shown that very similar results may be produced by ligature of the vena portæ.³ These observations would also explain some cases when acutely produced recent ulcers of the stomach and duodenum have been observed in pyæmic or metastatic affections, and possibly in the puerperal conditions to which allusion has been already made.⁴

It has been remarked by Virchow that both the shape and also the most common positions of these ulcers point in many cases to their arterial origin, and that the conical form, with the base at the mucous surface, corresponds to the ramifications of the capillary branches spreading outwards from a main trunk, which has been obstructed in the deeper tissues, and thus resembling precisely the results of arterial embolism in other parts where similar appearances are seen.

The appearances of extravasations found in connection with some recent ulcers, which have been before alluded to, seem also in a great degree to confirm this theory of their hemorrhagic origin. It may further be noted that many of the causes to which their production has been attributed are such as would coincide with this opinion, though their inconstancy in this respect is easily explicable, when we consider that though the tendency of the majority is to produce congestion of the stomach and intestines, yet that this may proceed to a marked degree without necessarily involving the

¹ Virchow's Archiv, xxv. p. 491 et seq.

² Loc. cit., p. 272 et seq.

³ It is remarkable that cirrhosis of the liver does not more frequently give rise to ulcer of the stomach. Frerichs only gives three cases of the latter disease associated with disease of liver. Only one of these was associated with chronic atrophy. Förster gives a case of ulcer of the duodenum associated with cirrhosis, Würzburg Med. Zeitsch. 1861, ii. p. 165 (Krause). A case is recorded by Gunsburg, Arch. Phys. Heilk., where the determining cause of the ulcer appeared to be the obstruction of a vein in the stomach itself.

⁴ See a case by Buhl, Bericht über 280 leichen Oeffnungen, Henle and Pfeuffer's Zeitsch. Rat. Med., 3d ser. viii. 1857, p. 34, where there were recent perforating ulcers of the duodenum and intestine in a case of pyæmia associated with parotid abscess. See also a case of gangrene of the intestine from embolism, Gaz. Hebdom. 1862, Oct. 3. A similar case is given by Cohu, Klinik der Embolischen Gefäss Krankheiten, 231. There was thrombosis of the pulmonary artery, an abscess under the mucous membrane of the stomach, and similar ones in the small intestine.

occurrence of such extravasations as are capable of giving rise to extensive or deeply spreading necrosis of the coats of these organs. Some clue may thus be gained to their frequent appearance in connection with disturbances of the menstruation, which are known to give rise to great disorder in the functions of the stomach. This is further evidenced by the hemorrhage from this organ, which occasionally replaces that from the uterus, and which must necessarily have been preceded by an extreme hyperæmia, not only of its lining membrane, but also of all the vessels supplying it; while the not unfrequent coincidence of the disease with the puerperal state may be attributed either to conditions of congestion, or, probably in many, to embolism associated with pyæmia.

A similar origin may also with great probability be ascribed to duodenal ulcers commencing after burns of the skin, though it is possible that the direct mechanism of their production may be by means of embolic processes rather than through simple congestion. Their site in these cases, however, appears to require further explanation, since the possible implication of Brunner's glands, suggested by Messrs. Bowman and Curling, does not appear completely to elucidate their peculiar frequency in this position under these circumstances, as compared with their relative rarity under other conditions. The appearances of recent extravasations observed in several recorded cases of this nature may very properly be placed in juxtaposition with Rokitsanski's observations on the frequency of hemorrhage from the lower portions of the intestinal canal in connection with similar causes, as pointing to their origin in intense congestion leading to rupture of the vessels.¹ A similar explanation may thus be afforded of an instance recorded by Cruveilhier,² when the symptoms of ulceration followed an attack of cholera; for although in this disease hemorrhage is more common in the intestines than in the stomach, yet extravasations in the latter are also occasionally observed.³

Dr. Copland's independent testimony⁴ confirms Virchow's opinion that extravasations having a similar result may arise through atheromatous degeneration of the coats of the vessels of the stomach.

¹ Mr. Erichsen had previously pointed out only the probability of the extreme congestion of the gastro-intestinal canal acting as the cause of these lesions.

² *Rev. Méd.* 1838, iii. 32. *Path. Anat.*, Liv. xx.

³ See author's report on Stomach and Intestines in Cholera. *Path. Soc. Trans.* 1867. Also Cruveilhier, *Path. Anat.*, Liv. xiv. Also Buhl, Report of Munich Commission on Epid. of Cholera, 1854, p. 500.

⁴ *Med. Dict.*, vol. iii. pt. 2, p. 919.

Frerichs, also, in a case where an ulcer of the stomach followed the obstruction of the gall ducts,¹ has pointed out that Kölliker and Müller² observed the disease in the duodenum in cases where the common bile duct had been ligatured, and where also calcareous matter was deposited in the branches of the coeliac axis and in those of the mesenteric arteries.

Our knowledge of other possible causes of the disease must be considered as yet imperfect.³ It may be questioned whether inflammatory states often, if ever, exist in the stomach to a degree sufficient to act in a manner similar to the conditions which have now been described. It appears improbable that the follicular ulcerations proceeding from the solitary glands of the mucous membrane often extend beyond the area occupied by these structures, though the distribution of anatomical elements of a lymphatic character has been shown, by Dr. H. Jones's and the author's observations, to extend more widely in the mucous and submucous tissue, than has been sometimes supposed.

Another more likely cause, though of rarer occurrence, is found in those cases where profuse suppuration takes place in the submucous tissue, the effects of which are extremely likely to arrest the vascular supply of the mucous membrane.⁴

It is also not impossible that excessive secretion, or excessive acidity of the gastric juice, particularly in the absence of food in the stomach, as when the secretion is excited by alcoholic drinks, may also give rise to ulceration, since it has been shown that an excess of acid introduced into the stomach may produce similar effects.⁵

However originating, the peculiar tendencies to extension and perforation seem to be especially communicated to these ulcers by the action of the gastric juice; for though ulcerations of the lower portions of the intestines are very common in other diseases, perforation is a very rare event, unless caused by the direct necrosis

¹ *Dis. Liver*, Syd. Soc. Trans., by Murchison, i. 137.

² *Würzburg Verhand.*, vi. 474.

³ An experiment of Frerichs, *Dis. Liver*, i. 187, would lead to the question whether disturbances of the circulation or of the nutrition of the stomach through derangement of the nervous supply may not occasionally produce this effect. He found an ulcer of the stomach in a cat after division of the splanchnic nerves and of the coeliac plexus.

⁴ See Dittrich, quoted by Brand, *Ueber Stenosen des Pylorus*, Diss. Inaug. Erlangen, 1851; also Reynaud on *Gastritis Submucosa*, *Bull. Soc. Anat.* 1861, 2d. ser. vi. 89, cases quoted of this possible origin of ulcers.

⁵ See notes 6 and 7, p. 181.

of the new formations of tubercle or typhoid. It is also worthy of remark that ulcers of the kind now described are, with rare exceptions, limited in their appearance to the upper part of the canal, where the solvent power of the gastric juice is still active, that of the intestines on protein substances being very inferior in this respect; and though the causes of ulceration may affect equally the whole canal, these special effects are only produced by the additional influence thus exerted.

SYMPTOMS.—The symptoms which are characteristic of this disease have been enumerated as pain, vomiting, hemorrhage, disturbances of the digestion, and alterations of the secretions of the stomach. The whole of these are not, however, constantly present in any single case, and there is a considerable diversity observed in their relative predominance, and in the order in which they appear; while in a certain number, and especially in those which run a rapid course, leading to perforation, the disease may have been entirely latent until within a few hours of a fatal issue.

Pain may be regarded as the most constant of these symptoms, so much so that in its absence the diagnosis of gastric ulcer would scarcely be justified during life. It is often the earliest in its appearance, though in some recorded cases it has been preceded, for a longer or shorter period, by disturbances of the digestion, and also by pyrosis, or by excessive secretion of acid supervening immediately after meals.

There are considerable differences, however, observed in its character, intensity, duration, and mode of accession, which appear to be in some measure explicable by the extent of the ulcer, by the implication of large nerve trunks, and by the manner in which, from its position, it is affected by the movements of the stomach.

It seems, however, not unimportant to observe that the varieties of pain described, though not in all cases absolutely distinguishable, may be divided into two classes. The first of these is more or less constant, and its characters are described as those of wearing, burning, boring, but rarely (Brinton) sharp and lancinating; often confined to a very limited space at the epigastrium, but felt also in the back behind the dorsal and first lumbar vertebræ, and between the scapulæ, in both of which latter situations, as remarked by Cruveilhier, the pain may sometimes exhibit a greater intensity than at the epigastrium. It is sometimes felt also towards the hypochondria or umbilicus, and deviations in these directions have

been found by Dr. Brinton to accord with corresponding variations in the site of the ulcer. It is generally increased, and only in rarer cases relieved, by taking food. The second variety tends to occur in paroxysms, and is felt over a more extended area. It is of intense severity, so as sometimes to cause fainting, or even convulsions (Bamberger). The attacks, which are usually described as cardialgia, are often attended with strong abdominal pulsation, probably due to a reflex paralysis of the muscular coats of the abdominal aorta.

The more constant pain, which in many cases, when exacerbations are absent, consists rather in a sense of uneasiness than of more acute suffering, seems to be directly referable to the existence of the ulcer, and is felt with a severity proportioned to the depth to which it has extended, and especially to the implication of the peritoneal surface of the organ. The paroxysmal form is generally relieved by emptying the stomach of its contents by vomiting; hence in many cases it is probable that it is due directly to the irritating effects of food, and to the movements of the stomach caused by its presence, and also to distension by flatus, or to the generation of abnormal acids by fermentation, most of which causes act with greater intensity when adhesions have been contracted to surrounding parts.

These paroxysms have also been met with when large branches of nerves¹ have been invaded by the ulcer; and as their frequency and intensity have in some cases been found to correspond with the occurrence of hemorrhage, and also with the size of the ulcer, it is not improbable that they are in some measure connected with its extension. They are also not unfrequently caused by moral emotions, and by exposure to cold and wet, or by bodily exertion; so that, although in the majority of cases they are explicable by the physical condition of the stomach, a certain class remains in which the paroxysmal character must be referred to special conditions affecting the nervous system; and some instances are recorded by Traube² when during these attacks there was hyperæsthesia or anæsthesia of the cutaneous surface of the thorax, and even pain extending down the arm.

Complete intermissions of pain, sometimes extending over a considerable period, are occasionally observed; or there may only remain in these intervals a slight degree of epigastric uneasiness,

¹ Habershon, loc. cit., 129, 131,

² Deutsche Klinik, 1861, p. 63.

somewhat increased by taking food. It is a not improbable inference that the relief thus experienced may be due to periods when a cicatrization of the ulcer is taking place, since the converse condition, viz., its extension, appears to be associated with periods of *aggravation.

Aggravations of the pain have been observed to precede the menstrual period, and to diminish in intensity on the establishment of the discharge.

The pain is almost invariably¹ aggravated by pressure, and there is frequently such a degree of epigastric tenderness that the slightest pressure from the clothes, or the gentlest touch by the hand,² becomes unendurable. The amount of tenderness depends in some degree on the position of the ulcer, those situated on the posterior surface being less affected by manipulation. In some cases an increase of the dorsal pain has been observed to follow pressure on the epigastrium.

The effect of food is also most invariably to bring on or to aggravate pain already existing. The period at which the pain follows its ingestion varies in different cases, and in some it has been observed to depend on the site of the ulcer, those in the neighbourhood of the cardia or fundus being often more speedily followed by this symptom than when the disease is situated in more distant parts of the organ. It is seldom, however, that its appearance is long delayed; and in fact the early supervention of this symptom under these circumstances is one of the most valuable diagnostic criteria of the nature of the complaint.

When pain occurs at longer intervals after food, as after a lapse of one or two hours, it is in all probability attributable either to flatulent distension of the stomach, or to excessive acidity, or in some cases to the position of the ulcer at the pyloric orifice, or in the duodenum, when the passage of the food from the stomach brings on an aggravation of suffering. It does not appear, however, that this difference can be depended upon with any certainty

¹ Exceptional cases are recorded by Abercrombie, Henoch, Cruveilhier (Path. Anat., livr. x., xx.), and by Miquel (Van Deen, Schmidt's Jahrbücher, li. i. 39), where strong pressure on the front of the abdomen gave relief. In one of Cruveilhier's cases the ulcer was situated on the posterior wall, in another on the anterior surface. Miquel advances in explanation of these cases the probable hypothesis, that the mitigation thus experienced, which was particularly observed during paroxysmal attacks, may be due to the restraint thus exercised on the movements of the stomach.

² The necessity of caution in this proceeding, to avoid rupture of the stomach, requires to be insisted upon.

as a test of the position of the ulcer, for the symptom may be early excited, whatever the site of the disease; and, secondly, food passes out of the stomach, though in comparatively small quantities, at a very early period after its introduction.¹

Variations in the intensity of the pain have been observed to depend on the position assumed by the patient being such as to free the ulcer from contact with the contents of the stomach.² This test also is not, however, infallible, as in some cases the severity of the pain, whatever the site of the ulcer, is unaffected by posture, and in some it has even been relieved by the patient lying or pressing towards the seat of the disease.³

Though no small share in the production of the pain by food is probably due to the movements of the stomach and to the acid secretion excited by the food, yet it is found that in the majority of instances its severity is increased by indigestible and stimulating substances, and by hot liquids. Some very exceptional cases are, however, recorded, not only in which bland articles of diet have given relief—a more common occurrence—but also where stimulants, and even brandy, have sometimes mitigated severe pain.⁴

Vomiting stands next to pain in order of its frequency and importance. It is, however, sometimes absent throughout the whole course of the disease, while in other cases even the blandest articles of food are immediately rejected. Ulcers situated in the neighbourhood of the pylorus seem to be more constantly associated with this symptom than those found in other parts. In some cases it appears as a mere regurgitation of the food, without much nausea or straining; and it usually attends and sometimes terminates the paroxysmal attacks of pain.

The matters vomited vary; food is returned altered in proportion to the time during which it has remained in the stomach. Acid or neutral fluids are also brought up, sometimes in considerable quan-

¹ See Dr. Stretton's case, before quoted; also Busch's observations on a case of duodenal fistula. *Virehow's Archiv*, xiv.

² First observed by Dr. Osborne, *Dub. Med. Journ.*, xxvii. 361. Dr. Brinton says that two-thirds of the cases which he personally observed exhibited a marked influence of posture on the pain.

³ See Brinton, *Ulcer of Stomach*, p. 71; also Chambers, *Lond. Journ. Med.*, 1852, and Nasse, *Schmidt's Jahrbucher*, 72, who found an ulcer of the anterior surface relieved by a prone decubitus.

⁴ See a case by Mr. Travers and Dr. Farre, *Med.-Chir. Trans.*, vol. viii. Several cases of this kind, chiefly from foreign authors, are also quoted by Miquel, *loc. cit.*, p. 16; in some of them the diagnosis of ulceration was verified by post-mortem investigation. See also Duchek, *loc. cit.*

ties, either independently of food, or, when accompanying it, far exceeding the amount of fluid which has been swallowed. In other cases evidence of the destruction of adjacent organs has been found in the vomited matters, as liver structures¹ and the elastic fibres of the spleen.²

The *sarcina ventriculi* is occasionally, but not frequently, seen in the vomited matters.

Hemorrhage is generally revealed by vomiting; when, however, small quantities of blood are effused, it is possible that they may often escape notice, and therefore the frequency of this symptom cannot be accurately estimated. Of larger hemorrhages, Miquel has found fifteen instances in ninety-one cases, while Brinton thinks that they occur in about one-third of all the cases of ulcer. In a case recorded by Cruveilhier³ the hemorrhage from the stomach frequently recurred at the menstrual periods, and sometimes replaced this discharge.

The characters of the blood brought up differ with the amount effused, and also with the rapidity with which it has escaped. Smaller quantities have usually a black or coffee-ground appearance, which may only appear in striæ, or patches on the mucus or food by which they are accompanied. Larger hemorrhages poured out quickly from arteries of considerable size may, when vomited, still retain an alkaline reaction and arterial colour; while in other cases the blood is coagulated, and more or less blackened by the action of the gastric juice.

In some instances, however, none of the blood effused is vomited, but the whole escapes by the bowel. The blackened and tarry appearance which the evacuations present under these circumstances, and the distinguishing features of its origin, will be hereafter described (see Hemorrhage). In a third class, the hemorrhage may at once prove fatal by causing syncope, without previous vomiting, and the cause of death may only be revealed *post mortem* by the distension of the stomach and upper part of the small intestines by large quantities of blood.

Certain prodromata may precede or accompany the hemorrhage. The chief of these are a sense of heat, pulsation, fulness, weight or load at the epigastrium. They are not, however, commonly

¹ Miquel, loc. cit., p. 25.

² Sangalli, under Virchow, Schmidt's Jahrbücher, 1854, iv. 45.

³ Path. Anat., Liv. xx.

prominent, and are frequently unmarked, and the expulsive act is rarely preceded by any long-continued nausea. The prostration which follows excessive bleeding is sometimes very serious and alarming. The patient may be completely blanched, and the slightest movement may threaten syncope. When this condition persists without vomiting, a sedulous examination of the stools is necessary, to avoid the possibility of overlooking a loss of blood which is still proceeding, but which is only revealed by such an investigation. Blood thus escaping by stool sometimes causes diarrhoea, at others, griping and colicky pains.

The digestion is liable to be influenced by various circumstances, which form very complex features in estimating the influence of this particular disease upon the functions of the stomach, and it is difficult to separate its derangements from the pain to which the mere contact of food with the surface of the ulcer gives rise. When the mucous membrane is but little affected, it may proceed almost unimpaired. The mere presence, however, of the ulcer generally brings with it conditions of derangement which are seldom without an unfavourable influence, through the effects of adhesions impairing movement, or through the direct influence of pain, or through the invasion of the nerves by the ulcer either directly impeding the secretion of the gastric juice, or giving rise to various abnormal alterations of its quality.

The evidence of this latter state is often the most prominent, and pyrosis of an acid or alkaline character may constitute for years the chief symptom present; but few cases escape without other dyspeptic derangements, and flatulence is a very common symptom. In other instances the digestion appears to be simply delayed, and to be attended throughout by a sense of epigastric load and uneasiness, and with eructations which are very liable to pass into vomiting. These symptoms are also largely influenced by the nature of the food taken; and though idiosyncrasies¹ exist in this respect forming exceptions to the rule, they are usually aggravated by indigestible substances of all kinds.

When pyloric obstruction has been caused by an open or cicatrized ulcer, these symptoms are greatly aggravated. Nor does the healing of ulcers situated in other parts bring complete alleviation, as the contractions thence resulting may greatly interfere

¹ See some cases by Oppolzer, *Wien. Med. Woch.* 1851, where raw ham agreed well.

with the movements of the organ; and long persistent dyspepsia has been traced to this cause.

The appetite often suffers but little; frequently it is excessive and ravenous—a condition explicable in some instances by the loss sustained through vomiting, but in others probably to be referred to perverted innervation. When severe pain is present, it is often diminished. In some of these cases patients desire to eat, but fear to do so on account of the pain excited by food; in others a true anorexia is present.

The appearance of the tongue is probably influenced in no small measure by the condition of the mucous membrane of the stomach. In many cases it presents no deviations from that of health; in others it is more or less furred, or red and fissured. Sometimes during exacerbation of the disease, it becomes aphthous (Abercrombie and Henoeh). It may, however, be stated, that as a general rule it offers no distinct indications either of the presence or nature of the disease.

An excessive secretion of saliva,¹ in which the sulphocyanide of potassium is remarkably deficient (Bamberger), has been not unfrequently observed.

Constipation is a very constant symptom. It is probably in some cases due in part to the vomiting; but some influence may also be ascribed to reflex impairment of the intestinal action from the presence of the disease; in other instances, as in one recorded by Dr. Budd,² it is directly due to adhesive peritonitis gluing the coats of the intestines together, a condition which can scarcely be supposed to exist without some degree of simultaneous muscular paralysis. In some cases the constipation has a tendency to increase the vomiting, which then may be relieved by acting on the bowels by means of enemata.

The general strength of the patient often suffers in an extreme degree in the later stages of the disease. When vomiting is a prominent symptom, and when hemorrhage and severe pain are superadded, a cachectic condition is induced, which it is exceedingly difficult, if not impossible, to distinguish, *per se*, from that of cancer. There is often the same earthy tint of skin; and in females, in whom the menstruation is disturbed, this may exist to a very marked degree. Others have after hemorrhage the waxy look of

¹ Osborne, Dub. Med. Journ., xxvii. 365.

² Loc. cit., 128.

extreme anaemia; and the latter appearance is extremely common in young girls who are the subjects of the disease.

Cachexia, however, except when hemorrhage is present, does not usually occur early in the disorder; and when vomiting and hemorrhage only take place at long intervals, both it and emaciation may be absent during many years, in which the disease has, in all probability, existed.¹ Cases also are met with in which, though presenting very characteristic signs of the disease, no external appearance of departure from sound health is observable, while in others, which have run an almost latent course, the only symptom observed has been a gradually progressing emaciation.²

In other instances, as was observed by Jaksch, the disease appears to run an acute febrile course, with dull pain at the epigastrium, nausea, and vomiting, a loaded tongue, on which aphthae are observed, with complete anorexia. The fever is more or less continuous; the skin is hotter than natural, and the cheeks are flushed. This condition, of which I have observed some instances, tends especially to occur during periods when pain has been more than usually severe. Its appearance may probably be accounted for either by the supposition of an inflammatory condition of the rest of the mucous membrane of the stomach, or, in the cases in which this symptom has appeared towards the close of life, when the patients are exhausted by the duration of the complaint, it may probably often arise from some intercurrent inflammatory action, and especially from pneumonia, which is found to be a common complication.³ The frequency with which tuberculosis is met with in cases of the disease would also probably serve to explain the febrile reaction in such instances.

¹ A case by Hensch, loc. cit., ii. 122.

² Lees, Diseases of the Stomach, pp. 73, 74.

³ In the case before alluded to, where the ulcer was caused by the swallowing of hydrochloric acid, there was a second extension of the ulcer accompanied by a marked secondary series of pyrexial phenomena. A boy, æt. 11, swallowed 3j of "spirits of salt" on the 30th May. Admission to hospital on the 1st June, with pain in stomach and vomiting of blood-stained mucus. Pain and pyrexia, with a temperature not exceeding 100.4 Fahr., continued until June 5th. From this date the symptoms ceased, and the temperature remained normal until June 10th, when copious hæmatemesis occurred, followed by increased pain and tenderness. June 11th, temp. 99.2; June 12th, temp. 104.2; June 13th, temp. 101.2; June 14th, copious hæmatemesis, proving fatal within a few hours. There were adhesions of the stomach to the transverse colon and liver, but no other signs of peritonitis. This ulcer was situated about 1½ inches from the pyloric ring, and had perforated a large artery. No other condition could be found to account for the pyrexia.

The frequency of the connection of amenorrhœa with the gastric ulcer has been treated of in the etiology of the complaint.

The symptoms of duodenal ulcer differ but little from those which are met with when the disease occurs in the stomach.

Pain is often a less prominent feature, its absence being explained by Dr. Budd to depend on the fact that this part of the canal is subjected to less movement than the stomach. It may, however, exist with the same severity, and with all the features which have been before described; and, as in the case before quoted, it has been known to occur when the stomach is empty.¹ It has been observed in some cases to be limited to the right hypochondrium, and to be associated with marked tenderness on pressure in the same region. In a case recorded by Mayer an excessive feeling of hunger was noticed.²

Vomiting is also said by Krauss to be less frequent, and when present it is generally associated with stricture of the intestine. It sometimes occurs in connection with attacks of cardialgia, when its explanation is probably to be found in a reflected irritation communicated to the stomach.

Hemorrhages, revealed by vomiting or by the state of the feces, occur in about one-third of the recorded cases; and fatal cases, when death has taken place immediately by syncope, have also been recorded.³

The disease in this region also frequently appears to run a latent course, unrevealed by any symptoms beyond those of comparatively slight dyspeptic derangements, until fatal perforation suddenly occurs.⁴

Dr. Brinton has stated that diarrhœa is common in ulceration of the duodenum, and that it thus forms a contrast with the constipation observed when the stomach is the seat of the disease. Krauss, however, who appears to have collected the largest number of cases of this disorder, regards diarrhœa as being only an exceptional symptom, and says that constipation is the rule in the duodenal, as in the gastric, ulcer.

The symptoms of perforation, both of gastric and duodenal ulcers, are almost invariably sudden in their invasion; but in a few cases,

¹ See also a case by Mayer, loc. cit., 106.

² The same fact was observed in Busch's case of duodenal fistula.

³ Cas. Broussais, *Duodénite Chronique*, 1825, p. 65.

⁴ See some cases of this nature by Dr. Budd. Also one by Dr. Murchison, *Path. Soc. Trans.*, ix. 198.

probably where perforation has been gradual, they have been observed slowly to increase in intensity; and a similar course is witnessed in instances accompanied by the formation of local abscess in the cavity of the abdomen.

In the first class, however, which forms much the largest number, they usually supervene after a full meal, or after some violent exertion, or after vomiting, or the effort at defecation.¹ They are ushered in with an intense pain in the abdomen; sometimes a sensation of tearing has been described (Dahlerup); rigors have also been noticed at the outset. Severe general abdominal pain follows, which is greatly aggravated by vomiting or by severe retching. An intense degree of collapse is frequently associated with these symptoms; the face is pale and sunken, anxious, and hippocratic; the pulse small, rapid, and almost imperceptible; the limbs cold and tremulous; suppression of urine has been also observed,² and death may take place suddenly at this stage from shock.

If life is prolonged, the symptoms which follow are those of general peritonitis. The abdominal muscles are at first spasmodically contracted and drawn into knots (Crisp);³ subsequently the abdomen becomes greatly distended from gas escaping into its cavity, and the percussion note is uniformly tympanitic. The liver is also pushed backwards, so that its dull resonance in front is replaced by a tympanitic percussion note under the ribs (Oppolzer). Respiration is entirely thoracic and sighing, the knees are drawn up on the abdomen, and the patient is afraid to speak or move through fear of increasing his sufferings; the abdomen is also intensely tender on pressure. If life is sufficiently prolonged, signs of an accumulation of fluid may be detected in the lower part of the cavity; but death usually takes place in a few hours, or at most after two or three days.

In other cases, where circumscribed abscess has formed, the signs of general peritonitis may be wanting, and those of the localized inflammation may be more or less distinct, in the form of limited pain and tenderness, associated sometimes with circumscribed enlargement, and even with a distinct fluctuating tumour. In these cases symptoms of general peritonitis may follow at later periods, owing to the escape of the contents of the abscess into the abdo-

¹ Bouilland, *Arch. de Méd.*, i. 534, cited by Andral. Pressure on the epigastrium, through leaning out of a window, is mentioned as a cause by Hensch.

² Dr. Sedgwick, *Lancet*, June 15, 1867.

³ Also noted by Cruveilhier.

minal cavity. Perforation of other structures may be shown by a fistulous communication with the external surface, or by signs of empyema or pneumothorax, or by a large expectoration of puriform fluid, associated with more or less hæmoptysis, or by the physical signs of a cavity, or of circumscribed gangrenous pneumonia at the base of the lung, or, when the colon had been invaded, by the passage of undigested matter by stool soon after food has been taken, or by fecal vomiting,¹ and a fecal odour of the breath.

COURSE AND DURATION.—Both the course and duration of these ulcers are, as will be seen from the foregoing description, very variable. Two main classes may, however, be appropriately established; one, when the disorder is of short duration, tending either to an early cicatrization, or to a rapidly fatal termination by perforation or hemorrhage, and another, when the disease is of almost indefinite duration, lasting with intermissions during many years,² and occasionally interrupted by severe attacks of pain, vomiting, or hemorrhage—variations which may probably be explained by the occurrence of imperfect cicatrization alternating with renewed extension of the ulcerative process.

PROGNOSIS.—Cruveilhier's statement, that "the simple ulcer of the stomach tends essentially to a cure," is fully confirmed by the number of cicatrices found *post mortem* as compared with that of open ulcers. Additional support is afforded to a hopeful prognosis by recorded cases,³ where, after long persistence of the symptoms of ulcer, these had subsided, and the presence of cicatrices has been revealed by autopsies made after death from other causes, and sometimes after long intervals of time. It cannot, however, be denied that the dangerous nature of the events which may occur during

¹ This has been recorded in only one case by Abercrombie.

² Dr. Brinton quotes cases where evidence of continuous disease had lasted in one 35 years; in two 30; three or four 20; in four or five 15; and in several 10, 7, 5, and 4 years. Dr. King Chambers has also recorded a case (*Indigestions*, p. 185), where the patient died of ulcer of the stomach thirty years after the first hæmatemesis. Other instances are given by Cruveilhier and Dr. H. Jones.

³ Cruveilhier, *Archiv. Gén.* 1856, p. 160. The case of the celebrated anatomist Beclard, given by Billard, *De la Membrane Muqueuse Gastro-Intestinale*, 1825, p. 558, is an interesting example of this fact. After severe intellectual labour he suffered from pain at the stomach and vomiting; but by a careful diet, local bleeding, and counter-irritation these ameliorated, though only gradually. After his death, many years later, the cicatrix of an ulcer was found in the small curvature of his stomach.

its course contribute to impart to the disease a character of extreme gravity.

Even the periods of comparative immunity from the more urgent symptoms by no means, in all cases, justify the conclusion that the disease is at an end, for intermissions of these followed by renewed exacerbations are not uncommon. The hope of a permanent cure diminishes also in proportion to the length of time which the disease has lasted; the cicatrization in these cases being impeded by thickening of the margins of the ulcer, by the implication of other organs, and by the inversion of the mucous membrane into the funnel-shaped excavation.

When a cure is not effected, the progress to a fatal termination is generally slow, sometimes extending through periods of many years; the patient dying finally of exhaustion and marasmus induced by the pain, vomiting, hemorrhage, and disturbances of digestion.

In other cases, as has been before described, life may be immediately cut short by hemorrhage or perforation. The risk of the former of these accidents is not very considerable, amounting, according to the estimates of Dr. Brinton (with which those of Müller and Miquel pretty closely correspond), only to about $3\frac{1}{4}$ to 5 per cent. of all cases.

The frequency of perforation has been stated to be open to discussion; but under the most favourable estimates, the danger of death from this cause is considerably greater than that from hemorrhage. The prognosis in this respect is liable to be influenced by the age of the patient, for it has been seen that with advancing years the liability to this event is considerably diminished. The risk in the early periods of life appears also to be greater in the female than in the male sex.

Even, however, in the commonly fatal event of direct rupture of the stomach and escape of its contents into the cavity of the abdomen, life need not be absolutely despaired of, since cases have been brought forward which prove that recovery may take place even after this has ensued.¹

¹ See a most interesting case of this nature by Dr. Hughes and Messrs. Hilton and Ray, *Guy's Hosp. Rep.*, 2d series, vol. iv., of a girl in whom all the symptoms of perforation occurred, but ended in recovery. At a later period, after a meal which had greatly distended the stomach, the same patient was again attacked in a similar manner, and death ensued. At the autopsy two open ulcers were found in the stomach, one of which had perforated. There was a cicatrix of a

After the formation of an external fistula through the abdominal parietes, life in some cases seems to be prolonged without much suffering, and cases of cure by closure of the external opening have been recorded.¹

Even with the completion of the process of cicatrization the cure of the patient can hardly be said to be perfect. The cicatrix by involving branches of nerves may be the source of long-continued pain, and probably also of derangements of the gastric secretion, while alterations in the shape of the organ, arising from the healing of large ulcers seated in its central portions, may often, by interfering with its movements, prove the source of permanent disturbance of the digestion. The evils resulting from contractions, from the same cause, of the pylorus and duodenum will be again alluded to. Nor can the risk of a renewal of the ulcerative process in the tissue of the cicatrix be lightly passed over, since many cases are recorded in which the disease has returned in its original seat, and ended in perforation or hemorrhage after the ulcer had been apparently closed, or, at least, after all the more urgent symptoms had ceased for years; a liability which induced Cruveilhier to express the opinion that both these accidents are more liable to occur "consecutively"—i. e. by the erosion of the cicatrix—than "primitively" during the period of the formation of the ulcer.²

Nor can another liability be forgotten, of which proof is afforded both by the multiplicity in some cases of open ulcers, and by the frequent coexistence of these with cicatrices—viz. that the causes inducing the disease tend to remain in operation in the same individual, and that, though one ulcer may have healed, another may be formed and may prove fatal at a subsequent period.

DIAGNOSIS.—The symptoms of ulcer of the stomach require to be distinguished from the severer forms of neuralgic affection, from some cases of chronic inflammatory action, from cancer of the stomach, and in some cases from colic. The distinguishing features

former ulcer, and old adhesions existed between the stomach and adjacent viscera, and also between coils of the intestine, giving evidence of the previous attack of peritonitis. Miquel relates a similar case of recovery, but not verified by post-mortem examination. Another of the same kind is given by Dr. Hughes Bennett, Clin. Med. 487.

¹ Dublin Journal, vi. 148, from an American source; Western Journal Med. Phys. Science, 1834. Middeldorp has also almost completely succeeded in closing a gastric fistula by a plastic operation, Canstatt's Jahresb. 1859, iii. 187, Brit. For. Rev., Oct. 1860.

² Arch. Gén., p. 160.

of the affection are severe localized *persistent* pain, intensified in paroxysms, aggravated by food, and associated with tenderness on pressure, with vomiting, and with hemorrhage, disclosed either by vomiting or by stool.

Without the simultaneous occurrence of the greater number of these symptoms, the diagnosis of ulcer must often remain somewhat uncertain, and it is the combination now enumerated which must mainly serve as the basis of diagnosis.

Some of them, however, are more frequent than others, and localized pain aggravated by food and associated with localized tenderness is sufficient to excite the gravest suspicions of the nature of the disease.

In another class, however, persistent dyspeptic symptoms associated with extreme degrees of acidity, unaffected by food or by treatment, have proved the sole symptoms of the disorder, which has ended fatally by perforation.¹

The diagnosis from *chronic catarrhal inflammation* is as a rule only difficult in those cases of the latter disorder which are attended with hæmatemesis from congestion. The distinctive features of this form of disorder have been already described (see *Chronic Catarrh*, pp. 900, 906). The other forms of chronic catarrhal inflammation are rarely associated with distinct or severe gastric pain. Vomiting also is a much rarer symptom. They are, further, usually associated with more marked symptoms of dyspeptic derangement, with a more loaded tongue, and with more thirst, malaise, and pyrexia than are commonly observed in cases of ulcer.

The chief features which distinguish *ulcer* from *neuralgic affections* of the stomach have been already passed in review; it may be stated, in addition, that the aggravation of the pain by pressure, when tenderness of the muscles can be excluded, is another most important means of diagnosis. It is rarely absent, unless in cases when the ulcer is situated in the posterior wall of the stomach, and even then it can usually be elicited on deep pressure; and the exceptional cases in which the pain of ulcer has been noticed to be relieved by pressure are scarcely sufficiently numerous to invalidate a diagnosis founded on these data. The tenderness in ulcer also exists in the intervals of the paroxysmal pain. Aggravation of

¹ Abercrombie, loc. cit. 57. Henoeh, iii. 122.

the pain at the menstrual period in females is of less value, as it has been observed both in cases of neuralgic origin and also in ulcer. Exceptional cases may, however, occur in the vomiting from cerebral disease, when epigastric pain, tenderness, and hæmatemesis have all been present, but when no lesion has been found in the stomach after death.¹ They are fortunately, however, of extreme rarity, since the criteria for an accurate diagnosis are in such instances almost entirely absent. The danger, however, consists rather in overlooking the cerebral condition, than of mistaking the nature of the disease of the stomach.

The paroxysmal pain associated with the *passage of gall-stones* may sometimes be a cause of some difficulty in the diagnosis, particularly as it is often associated with tenderness in the right hypochondrium.

The chief points which distinguish this affection are its sudden invasion, its violence while it continues, the persistency of the vomiting, the coexistence of some enlargement of the liver and of an icteric tint of skin, the absence of hæmatemesis, and the immunity from epigastric tenderness and from dyspeptic disturbances in the intervals.

The diagnosis of the site of the ulcer is sometimes aided by the effects of position in the relief of pain,² and in the relative rapidity with which this symptom appears after the ingestion of food, which occurs in some cases earlier when the ulcer is seated near the cardia or in the fundus than when it is situated in the pylorus or duodenum. Pain in the back has been observed to be more severe when the ulcer is on the posterior surface. Excessive tenderness on epigastric pressure has been found associated with those situated on the anterior wall. Absolute accuracy of diagnosis of the site of a duodenal³ ulcer from one situated in the pylorus, except in cases when the former gives rise to jaundice from obstruction of the common bile duct, appears to be practically almost impossible.

The diagnosis of the event of *perforation* is one of extreme

¹ See a case by Empis, De la Graulhe, p. 154, when this combination occurred in a case of tubercular meningitis.

² In some cases by Osborne, loc. cit., the patient could lie on the affected side when the stomach was empty, but this position caused pain when food had been taken.

³ It is desirable to recall the rapidity with which food passes from the stomach, as showing that very little reliance can be placed on any distinction of the period at which the pain occurs.

importance in relation to treatment. Unfortunately, the distinction of its early stages from attacks of colic is a question of great difficulty, as is attested by more than one recorded error in diagnosis.

When the event has been preceded by recognizable symptoms of ulcer, its characters can seldom be mistaken; but its sudden invasion, when the disorder has run a latent course, may easily be misapprehended. The chief criteria are the greater severity of the pain, and also of the collapse in cases of perforation, together with the early accession of general tenderness of the abdomen, with vomiting, and with other signs of peritonitis. Severer attacks of colic are often preceded by a history of flatulence and constipation, and by previous slighter forms of the disorder. They are also generally of more gradual invasion than is observed in the pain of perforation. Local spots of tenderness in the course of the intestines can usually also be discovered; and in their neighbourhood some variations in the percussion note are generally to be observed. In cases of perforation, on the other hand, the whole abdomen early becomes tympanitic. The difficulty of diagnosis should always induce caution in administering purgatives in cases where any doubt exists regarding the nature of the affection.

It must be recollected that pain after food may remain after cicatrization has been effected. It has been supposed under these circumstances to be due to the irregular contractions of the organ giving rise at times to spasm.

The diagnosis of perforation of the pleural cavity or of the lung must depend on the occurrence of the physical signs of pleurisy, or of the formation of cavities in the pulmonary tissue. That of perforation of the colon has been in some cases disclosed by the passage of undigested food, or by fecal vomiting.

The diagnosis of ulcer from cancer of the stomach will be considered under the head of the latter disorder.

TREATMENT.—The principles to be followed in the treatment of this affection may be briefly summarized under the following heads: (1) Rest. (2) The cure of conditions of the stomach which cause undue acidity from fermentation or hypersecretion. (3) The relief of pain. (4) The relief of vomiting. (5) The arrest of hemorrhage. (6) The relief of constipation. (7) The treatment of perforation.

The measures indicated under the first two divisions are, in great part, regimenal and dietetic. Medicinal remedies also aid these, and are applicable to most of the subsequently named.

(1) It has been seen that many of the most urgent symptoms result from the movements of the stomach in the act of digestion; and our first indication is to reduce these, as far as possible, to a minimum amount, and to maintain the strength of the patient by the smallest quantity of the most digestible food necessary for this purpose, and especially to avoid distension of the stomach by any single large meal.¹

The same principle should be kept in mind by endeavouring to reduce, as far as possible, all waste of tissue by bodily exertion; and for this purpose complete rest should be enjoined, and the warmth of the body should be fully maintained by external clothing. Confinement to bed during all the severer exacerbations is almost indispensable.

Cruveilhier's method of restricting the patient to a milk diet has been justified by the success which usually attends this plan. The milk should be given in small quantities, rarely exceeding a teacupful, at intervals of two hours; and in severer cases or when vomiting is frequent, the amount must be restricted to table, dessert, or even teaspoonfuls. Long fasting is highly undesirable, and it is therefore better that the patient should be occasionally awakened in the night than that many hours should elapse without taking nourishment. The milk is often better borne when mixed with well-boiled arrowroot or biscuit powder, since its coagulation into masses in the stomach is thereby prevented. It should not be taken too hot; but there are great differences in individual patients with respect to the temperature at which their food can be taken. Some German authorities recommend buttermilk as a substitute, when milk in its ordinary form appears to disagree; or under these circumstances it may be diluted with water, lime-water, Carrara-water, or soda-water. The last combination is often the most agreeable to the patient. This method may often be continued for

¹ "Verum dum consolidandum est tale ulcus, caveri debet, ne a copiosis ingestis ventriculus distendatur, detraherentur enim denno illa quæ coire inceperant.—Præcipuum est ut nihil in victu exhibeatur quod exasperare possit hæc mala; jura carniū cum oryza cocta vel mollissimis oleribus hic sunt præcipua; vitelli ovorum, cremores hordei, avenæ ac similia parca copia simul data: ab his enim magnum solamen in doloribus illis chronicis circa ventriculum solent percipi."—*Van Swieten's Comm. in Aph. Boerhaav.*, ed. 1753, vol. iii. pp. 152, 153.

many days, or even a fortnight or three weeks, with great benefit; though at the end of this period the patients often acquire a great disrelish and even aversion to the milk diet, and some change may become necessary. It must, however, be borne in mind that occasionally an idiosyncrasy appears to exist against milk, which is not digested, but gives rise to flatulence, acidity, increased pain, and even to vomiting. In the case also of elderly people milk sometimes fails to nourish, and, unless a different diet be adopted, the emaciation and loss of strength of the patient will increase. Under such circumstances recourse must be had to animal broths, made strong, but given cool, and in similarly small quantities at each meal. If pain be severe, or vomiting urgent, I have found great benefit result from the adoption of the method proposed by Dr. Balthazar Foster,¹ of withholding all nutriment by the mouth and administering food entirely by enemata of strong beef-tea, or milk, with which brandy may be combined or not, in doses proportioned to the strength of the patient. Opium may also be given in these enemata, and it not only enables the rectum to retain them longer, but also alleviates the other symptoms. As the state of the patient improves, and the more urgent symptoms subside, more latitude may be permitted; but great caution should be exercised in this respect, even during periods extending over some years. Indigestible food of all kinds must be strictly forbidden, and great care must be continuously exercised to avoid undue distension of the stomach with any single meal, and the more so as the excessive appetite may often tempt the patient unduly to indulge in this respect. Hence, with the precaution that each meal should be small, food should be given at intervals of three or four hours, and milk may with advantage form a considerable proportion of the diet. Lightly-boiled eggs, when these agree, and the more digestible meats, which at first should be well stewed, may be cautiously indulged in. Bread should be eaten stale or toasted; but the use of vegetables should at first be restricted to potatoes in small quantities, and these are often replaced with advantage by macaroni. The importance of a perfect mastication of the farinaceous articles of diet, and indeed of all the food, should be strongly insisted upon. Hot liquids, and especially tea and

¹ *Lancet*, April 25, 1868, vol. i.

coffee, should be almost permanently excluded, and should, when possible, be replaced by milk and water, or by cocoa made from the nibs. Malt liquors are generally found to cause flatulence, and to aggravate the pain; Dr. Brinton has, however, observed that they sometimes agree in the case of elderly people. When stimulants appear to be required, dry sherry or pale brandy, in small quantities, and largely diluted with water, is the best that can be taken.

Sugar, since the objection made to its use by Cruveilhier, has fallen into general disrepute, and it should certainly be only moderately indulged in. It is a powerful stimulant to the mucous membrane of the stomach,¹ and it also easily undergoes acid fermentation—properties which tend to render its use undesirable.

(2, 3) The therapeutic measures under the second and third divisions include most of the remedies ordinarily employed in the treatment of ulcers of the stomach, and it is a question how far their action is directly excited on the disease itself, or in what measure their beneficial agency is due to their influence on the surrounding mucous membrane. The main object in the latter direction is to diminish hyperæmia and its cause, and to check catarrhal action; but as these indications can scarcely be distinguished separately, it will be best to speak of individual remedies which may be employed for these purposes.

The influence of bismuth in this disorder is too well attested to need any apology for placing it among the first on the list of appropriate remedies. Its beneficial effects in catarrhal conditions of the mucous membrane have been already treated of. Whether or not it exerts any direct influence on the ulcerated surface may be open to question, but such an action would at the least not appear improbable. It appears also to exercise an influence in checking hypersecretion, and for this purpose may be advantageously combined with kino and opium, both of which possess a similar power, or with opium or morphia alone, when this symptom is less marked. It may be administered in the form either of the subnitrate or subcarbonate suspended in mucilage. I have rarely found it necessary to administer a larger quantity than ten grains for a dose, repeated four times in the twenty-

¹ See Blondlot, *Exp. sur la Digestion*, p. 223.

four hours; but Dr. Brinton has employed larger quantities, as a scruple.

Opium is the remedy chiefly to be relied on for the relief of the pain and vomiting. The amount given should be sufficient for the more or less complete removal of the pain, and in severe cases several grains of the crude drug may often be given advantageously, in divided doses, in the course of twenty-four hours.

The utility of the salts of silver has been warmly disputed. There can be little probability that the nitrate in the small doses in which it can be administered (which should rarely, if ever, exceed half a grain to a grain) exercises an action on the surface of the ulcer similar to that which follows its application to external parts, since so large a proportion must, from the mucus present in the stomach, be immediately converted into the insoluble chloride. Its agency, however, in catarrhal affections of the stomach, and in cases where, from the pain and vomiting, there may have been great reason to suspect the presence of an ulcer, is so unquestioned, that though standing second to bismuth as a remedy in this disease, it may be regarded as a valuable adjuvant to our resources in cases when this remedy does not appear to exercise its wonted beneficial effects, and it will sometimes be found to relieve pain after bismuth has failed.

The employment of alkalies, among which may be included the bicarbonates of potash, soda, and magnesia, and lime-water, should be restricted to those cases where, together with flatulency, there is evidence of acidity, resulting from fermentation in the food. The presence of free acid of this nature must exercise an injurious influence, both on the surface of the ulcer and on the mucous membrane of the stomach, which may be appropriately neutralized by these remedies given between meals. Under other circumstances their use is injurious, as tending, when given on an empty stomach, to excite the secretion of the gastric juice; and except as simple palliatives, they are of no value in the acidity resulting from hypersecretion, which is best controlled by the treatment before mentioned. In cases, however, where they are applicable, the use of the natural or artificial Carlsbad-water has been found advantageous, and it has been highly praised by Ziemssen for its aperient action. Ziemssen considers that, in addition to the neutralization which it effects on the acid contents of the stomach, it has the further beneficial action that it tends to promote peristaltic action

of the viscus, and thus to prevent undue delay of the food in its interior and consequent fermentative processes.¹

When the severer symptoms have subsided, if there be evidence of anæmia, the use of iron may be most advantageously resorted to. The neutral preparations—such as the ferrum redactum, the ferri ammon. cit., or potass. tartrat., the carbonate of iron, or the mist. ferri co.—are those most suitable; they should at first be given in small doses after food, and their employment is to be discontinued if pain supervene. The recommendation of Abercrombie of the ferri sulph. in combination with aloes has been endorsed by Henoeh; but I confess that I regard those above mentioned as safer remedies in these cases.

Pain of a severe kind, indicating the extension of the ulcer, requires additional care in restriction of the diet, and in enforcing absolute rest. It is, as has been already stated, most effectually relieved by opium, to which, for this purpose, hydrocyanic acid is decidedly inferior. The effect of position should also be tried. Warm cataplasms and fomentations also afford relief, and a marked effect of this kind is sometimes produced by the application of a few leeches over the epigastrium, especially if the pain is localized in this region. Their number should, however, be limited to two or three, and it is not necessary or desirable to encourage free bleeding.²

Counter-irritation does not seem desirable during the attacks of severe pain, and, in some instances, when an ulcer has appeared to have formed adhesions near the surface, the application of a blister has been followed by increased suffering; but in the intervals and during the course of the disease the use of remedies of this class has been recommended by many careful observers, and when combined with other suitable measures appears to have conduced to a cure.³ Osborne recommended an issue made with caustic lime, but the least distressing counter-irritants are either mustard poultices, small blisters not exceeding the size of a five-shilling piece, or friction with croton oil.

(4) Pain is also frequently alleviated by the warm bath, and the

¹ Sammlung Clinischer Vorträge (Volkmann), No. xv.

² Dr. Brinton opposed the application of leeches altogether; but the benefit that often accrues from their use, by the relief of pain, appears to counterbalance the small loss of blood which they occasion. The cases for their employment require, however, to be judiciously selected.

³ See the case of Beclard, before quoted.

prolonged use of this remedy has been recommended both by Cruveilhier and by Andral, not only for this purpose, but also as an aid in checking vomiting. The pain of flatulent distension and spasm, though often relieved by opiates, requires occasionally, from its severity, a departure from the general principles of treatment observed in these cases. Emetics cannot be too strongly forbidden,¹ but the use of warm liquids sometimes relieves the spasm and promotes the evacuation of the flatus, or even the regurgitation of the contents of the stomach, in which these attacks commonly end. The aromatic spirit of ammonia may also be used for the same purpose. Nausea and vomiting may be treated, in addition to the remedies before quoted, by ice in small quantities, and by effervescent containing hydrocyanic acid, though the latter are of less efficacy than preparations of opium. This symptom, when obstinate, requires the most extreme restriction of the diet; and it is often advantageous during some hours, or even some days, to avoid introducing any food into the stomach, and to maintain the strength of the patient by nutrient enemata given in as small a bulk as possible. Milk, beef-tea, eggs, and, if necessary, small quantities of brandy, may be given in this manner; and Dr. Brinton, on the advice of Dr. Hawkins, employed cod-liver oil for this purpose with beneficial results. Even opiates may thus be administered with advantage, when rejected if given by the mouth. Thirst may be quenched by slowly sucking small pieces of ice.

Vomiting appears in some cases to be maintained by a loaded condition of the bowel, and in these the administration of a purgative enema is sometimes beneficial.

(5) Hemorrhage must be controlled by cold and by direct astringents. I have found none so dependable as the acetate of lead given in doses of three or four grains, in combination with a quarter of a grain of opium, every two or three hours. Turpentine has been recommended by Hunter, and its utility has been confirmed by Drs. Graves and Seymour. Dr. Budd thinks it more useful in cases of capillary hemorrhage than when the blood proceeds from

¹ The danger of these was recognized by Schmidtman, *Summa Observationum Prax. Med.* iii. 224, 395, who in addition to cases within his own experience, where they were followed by a fatal issue, quotes a case from Boerhaave, that of Admiral Wassenaer (*Op. Omnia*, 1738, p. 98), who died of rupture of the œsophagus from this cause.

larger vessels. The use of other remedies of this class will be further alluded to. (See Hemorrhage.)

Ice internally may be employed with advantage for the same purpose, and this agent and also opiates are useful in checking the movements of the stomach in the effort of vomiting, by which the tendency to bleeding is necessarily aggravated. During the continuance of this symptom the most absolute rest of body must be enjoined. The diet should be restricted, in the same manner as when vomiting is present. When severe collapse is threatened, stimulant enemata may be given, and ether inhaled. It is important also to watch the fecal evacuations after the hæmatemesis has ceased.

(6) Constipation is always to be treated with caution; an almost universal consent has proscribed mercurial preparations as injurious. When it does not nauseate or cause vomiting, there is no better laxative than castor oil; but, in the numerous instances in which its use is prevented by the intolerance of the patient, the best substitutes are aloetics and the pil. colocynthidis composita. The administration of purgatives by the mouth should, however, as far as possible, be avoided, and the action of the bowels assisted by cold or tepid enemata, in which manner also castor oil may often be beneficially employed.

(7) When perforation is threatening or has occurred, the most absolute repose to the patient and also for the stomach is an object of primary importance. In the former case Miquel has recommended that such a position should be maintained as to leave the ulcer free from contact with the contents of the stomach. When the event has taken place, no agent appears to have any curative influence but opium, and its use must be continued for many days; the nutrition must be also conducted entirely by enemata. The only favourable recorded terminations to this event are those where these plans were pursued. If life should fortunately be prolonged, the importance of a long-restricted diet, so as to avoid the distension of the stomach, cannot be too strongly insisted upon. Finally, patients should be warned that in intervals of comparative immunity from urgent symptoms they are still in danger of relapses; and a case by Cruveilhier,¹ in which a return of the ulceration after many years of immunity followed the free exhibition of

¹ Path. Anat., Liv. xx. p. 2.

purgatives for a cerebral affection, may well awaken the question put by that distinguished author, whether these remedies were not truly the cause of the relapse, and should induce caution in all treatment, hygienic and medicinal, of patients in whom the disorder has once existed. The later effects arising from constriction of the pyloric orifice may be obviated by the use of a diet chiefly solid in order to avoid distension by flatulence, or, when this has occurred, by the employment of the stomach pump after Kussmaul's method.¹

VI.

CANCER OF THE STOMACH.

TUMOURS forming in the coats of the stomach, and tending to ulcerate, have been known from very early times. Their nature, however, has only become more strictly defined by the extension of the knowledge of pathological anatomy, which has revealed the dependence of many cases formerly described as *melæna* and *cardialgia* upon growths of this nature.²

ETIOLOGY.—*Frequency*.—The estimates of the comparative frequency of this disease in relation to all other causes of death vary between 0.6 and 2½ per cent.³ It appears, therefore, that the dis-

¹ See chapter on "Obstruction of the Pylorus;" also Ziemssen, *loc. cit.*

² The most complete accounts of the pathological anatomy of this disease are to be found in Carswell, *Illustrations of the Elementary Forms of Disease*; Rokitsanski, *Path. Anat.*; and Cruveilhier, *Path. Anat.* (excellent illustrations of the colloid form). Their clinical history, etiology, and pathological anatomy have also more lately been described by Walshe, *On Cancer*; Lebert, *Traité des Malad. Cancéreuses*; Brinton, *Med.-Chir. Rev.* 1857, and *Diseases of the Stomach*; Dittrich, *Prag. Viertel-Jahresch.* vol. xvii. For other illustrations and cases see Abercrombie, *loc. cit.*; René Prus., *Rech. Nouvelles sur la Nature et le Traitement du Cancer de l'Estomac*; Barras, *Préc. Anat. sur le Cancer de l'Estomac*; Müller, *Krankhaften Geschwülste*; Bruch, *Henle and Pfeuffer's Zeitsch.* 1849; Bennett, *Cancerous and Canceroid Growths and Clinical Medicine*; Köhler, *Krebs und Scheinkrebs*, 1853; Broca, *Mem. Acad. de Méd.* 1852. See also articles in *Diet. des Sciences Méd.* and *Diet. de Méd.* by Bayle, and Fayol, and Ferus; Chardel, *Dég. Squirrheuses de l'Estomac*, 1804; Valleix, *Guide du Méd. Pract.*; Handfield Jones, Budd, and Habershon, before quoted. For other references see Walshe and Lebert, and articles in *Cyc. Pract. Med.* and *Copland's Dictionary*.

³ The smallest number is given by Tanchou (*Rech. sur le Traitement Médical des Tumeurs du Sein*, Paris, 1844), founded on an aggregate of 382,851 deaths in Paris, during the years 1830-40. Virchow (*Verhand. Phys.-Med. Gesell., Würz-*

ease is less common than the simple ulcer of the stomach, but its extreme fatality places it on about the same level in respect to its frequency as a cause of death.

Regarded in relation to primary cancers in general, that of the stomach is one of the most common occurrence. Tanchou's tables represent it as forming 25.2 per cent., Marc d'Espine's 45 per cent., and Virchow's 34.9 per cent. of the whole number of cancers recorded, equalling, if not exceeding, in frequency those of the uterus and mamma.

Age.—Dr. Brinton's returns from 600 cases show that three-fourths of these occur between 40 and 70; and that the greatest number is met with between 50 and 60; though, allowing for the number of all persons living, the maximum liability is found between 60 and 70—a result very closely corresponding for the particular organ with that deduced by Dr. Walshe for the whole class of these diseases.¹ It is decidedly a rare event in the earlier periods of life, but a case of congenital scirrhus of the stomach is recorded by Wilkinson;² though ordinarily, when occurring in this organ during childhood, it tends to assume the medullary form.

Sex.—The data on this head are somewhat uncertain. Brinton, from 784 cases, considered that there was an excess in the male sex in the frequency of its appearance. As other writers have, however, given very different proportions,³ the sexual influence cannot

burg, vol. x. and Krankhaften Geschwülste, vol. i.) and Brinton (loc. cit.) agree in their estimates of about 1 per cent.: that of the former author being based on a total of 3390 deaths in the mortality return of Würzburg during the years 1852-5; that of the latter on a collection of records of 8468 post-mortem examinations in various London hospitals. An almost similar correspondence in an average of 2 to 2½ per cent. is attained by Marc d'Espine (*Statistique mortuaire du Canton de Genève pendant les années 1838-1855*, *Revue Médicale*, 1858, quoted by Lebert and Virchow), and by Willigk (*Prager Viertel-Jahresch.* Nos. 38, 44, 50, 51); that of the former being derived from the registers of the Canton of Geneva, while that of the latter is founded on the recorded necropsies, amounting to 6196 cases, in the hospitals at Prague. Willigk's percentage of the relative frequency of cancer of the stomach to other cancers agrees very closely with Virchow's.

¹ Loc. cit., pp. 149, 151.

² *Edin. Med. Journ.*, Jan. 1841, quoted by Dr. Walshe, p. 146.

³ Brinton gives 784 cases; 440 males, 344 females.

Louis	"	33	"	20	"	13	"
Lebert	"	42	"	19	"	23	"
Marc d'Espine	"	116	"	54	"	62	"
Dittrich	"	159	"	64	"	95	"
Willigk	"	169	"	83	"	86	"

In Dittrich's and Willigk's cases there was an excess in the number of females dying in the hospital. Brinton considered that the excess in the male sex was

be considered very strong in determining or preventing the localization of the disease in the stomach; nor does the united influence of age and sex present at all the same remarkable etiological features as are observed in the case of gastric ulcer.

The remaining causes of the disease in this special seat are as obscure as those which determine its appearance in other parts.

Hereditary transmission appears to operate with the same uncertainty as prevails with regard to the whole class of tumours. Its influence as an occasional predisposing cause can scarcely be questioned, and the case of the Napoleon family, so often cited, is a striking illustration of this tendency.

The influence of direct irritation¹ or inflammatory action, maintained by Boerhaave and Van Swieten,² and also by Broussais and Andral³, and by other writers of the French school, can only have a direct influence attributable to them under circumstances of some⁴ as yet unknown constitutional predisposition. A direct effect also can scarcely be attributed to habits of spirit-drinking, or to blows, or other mechanical injuries or pressure on the epigastric region; nor even to depressing emotions when independent of the unknown antecedent conditions, though this class of causes has frequently been observed to favour either the immediate outbreak or the more active development of the growth.

What the local predisposition may be that causes the stomach with such great proportionate frequency to become the seat of this disease, can only be in a great measure a matter for conjecture. Virchow's argument that the organs and parts of organs which

due to the greater proclivity of the generative organs in the female to become the seat of cancer.

¹ Among the curiosities of this class may be mentioned cases where corrosive poisons have been followed by an outbreak of cancer: as after nitric acid, recorded by Andral, *Clin. Méd.* ii. 99; or arsenic, Dittrich, *Prag. Viertel-Jahreschr.*, xix. pp. 110, 114. The latter case may, however, be well contrasted with one quoted by Dr. Walshe, when a mass of arsenic was encapsuled in the stomach, without further apparent injury. (*Cancer*, p. 167.)

² *Comm. in Aph. Boerhaave*, 1758, vol. iii. pp. 147, 150.

³ *Clin. Méd.*, ii. 31, 60, 61.

⁴ Symptoms of chronic inflammatory action or dyspeptic disturbance have indeed been noticed to precede for many years the severer symptoms; but it is doubtful whether, on the one hand, these may not have been caused by a latent growth of the disease, and, on the other, how far, considering the prevalence of these symptoms in patients who do not become cancerous, any influence in the production of the disorder can be ascribed to such derangements. Beau, *Gaz. de Hôpitaux*, 1859, pp. 390-1, says that an "idiopathic" dyspepsia may long precede cancer of the stomach. Leber's analysis, however, would show that in the majority of cases of cancer of the stomach the digestion has been accomplished naturally up to the period of the appearance of the disease.

most frequently suffer from morbid growths are either those which, from their position or structure, are most exposed to or susceptible of injurious influences from external agencies, or are those whose nutritive processes¹ are conducted under special and peculiar conditions, finds at least a basis in the case of cancer of the stomach; but it is also deserving of notice, as pointed out by Dr. Brinton in relation to this question, that the disease only very rarely commences on the surface of the mucous membrane.

Marc d'Espine's returns show an excess of mortality from cancer of the stomach in the wealthier classes. Of twenty-one cases there were fifteen rich to six poor;² but these numbers appear too small to serve as the foundation of a comprehensive induction.

Bamberger states that it is most common in flabby and fat persons, but gives no further detail.

SYMPTOMS.—Cases of cancer of the stomach may be divided into two distinct groups: one in which the disease, even when attended by extensive ulceration, may run an almost latent course, and even arrive at a fatal termination, unmarked by any severer symptoms than anorexia and dyspeptic disturbances of a comparatively insignificant character, but attended by a gradually increasing emaciation and loss of strength; and a second, when its presence excites the more formidable disturbances of pain, vomiting, and hemorrhage. A third variety, however, occasionally occurs, in which cases that have presented the features of the first named class may towards the close assume the more distressing characters of the second. A fourth also is sometimes met with, where the pain or vomiting, which have been the first symptoms, has ceased, and the disease has advanced to a fatal termination, and where the only distinct symptom has been a steadily progressing emaciation (Abercrombie).

Cases of the first kind, though by no means rare in the history of medicine, do not form a large proportion of the whole.³ The

¹ Dr. Walshe's critical remarks on this question deserve the most attentive consideration, from the remarkable logical acumen with which he has handled it, *loc. cit.* pp. 94, 95.

² *Ann. d'Hygiène*, 1847, xxxvii. p. 323, quoted by Lebert.

³ For observations of this nature see Pemberton, *Dis. of Abdominal Viscera*, p. 84; Sir T. Watson, *Princ. and Pract. Physic*, vol. ii.; Seymour, *Med.-Chir. Trans.* vol. xiv.; Andral, *Clin. Méd.* ii. Cruveilhier also gives a case where the appetite and digestion were preserved, and the only symptoms were dropy, emaciation, and pyrexia: *Path. Anat.*, Liv. x. A very similar one is recorded by Aber-

absence of the more prominent symptoms may often be traced to conditions affecting either the site of the growth, the rate of its enlargement, or the depth and extent to which ulceration has proceeded, or the relation of the nerves or vessels of the stomach to the tumour.

In its ordinary course the disease is usually first manifested by symptoms of dyspepsia, beginning without apparent cause in a person who has arrived at middle age, and who often has previously enjoyed good health. These may be at first very undefined, consisting of weight and uneasiness felt at the epigastrium after taking food, and followed by gaseous, acid, or insipid eructations. The tongue in the mean time is usually found unaffected, pale, or presenting its normal appearance. Thirst is generally absent. Loss of appetite is often an early and prominent feature. The strength fails, and signs of emaciation, at first slight, become increasingly distinct. As the disease advances, the epigastric uneasiness passes into pain, which is often of considerable severity. Vomiting also takes place at irregular intervals. Rare at first, and attended only with the rejection of food, or of mucus, which may be stained or mottled with streaks, specks, or flakes of rusty, sooty, or coffee-ground tint, it occurs more frequently as the disorder progresses. Flatulence and constipation become at this period prominent symptoms, and the patient is often dejected, morose, irritable, or desponding. At variable periods in the history of the case, a tumour becomes perceptible in the epigastric region. In proportion as the disease is more fully declared, the epigastric pain, grows severe and distressing. Vomiting is frequent, and large quantities of more or less altered blood are at times ejected. The emaciation deepens into cachexia; the skin acquires an earthy tint; diarrhoea alternates with constipation; febrile action, akin to hectic, sometimes appears towards the close, though usually this symptom is absent; dropsy, general or local, occasionally supervenes; and the patient dies exhausted after one or two years of suffering, and with an extreme degree of marasmus.

These symptoms, however, often differ considerably in their relative intensity, and also in the order of their occurrence, and appear to merit some separate consideration.

crumbie. Even extensive ulceration appears in some cases to have been attended by little or no vomiting, and by only comparatively slight disturbance of the digestion.

The duration of the preliminary stage is very variable, and the disturbances in the digestion may present nothing characteristic, and may even be entirely absent up to the fatal termination (Cruveilhier).

Anorexia, however, though by no means constant (as the appetite is in some cases maintained to the close of life), is a very distinctive feature of the disorder. Generally it proceeds *pari passu* with the pain and with the increasing cachexia and debility, to which, in many cases, it stands in direct relationship. Sometimes, however, it occurs early in the disease, and appears to be quite unconnected with the latter symptom, and under these circumstances it is, according to Brinton,¹ more marked in proportion to the youth of the patient and to the softness of the cancerous growth. There are, however, intermissions sometimes of considerable duration, in this disrelish of food, and, instead of being lost, the appetite may be capricious or fanciful. According to Lebert's and Brinton's estimates, anorexia occurs sooner or later in from 78 to 85 per cent. of all cases of cancer of the stomach, and thus forms a remarkable contrast with the condition of the appetite in cases of gastric ulcer. When, however, vomiting is present, and especially when this arises from obstruction of the pylorus, the appetite may be found to be increased.

Pain is the most constant,² as well as the most marked symptom. It is frequently the first in its appearance, and is often during a long period the only evidence of the disease. At first it seldom presents the same intensity as in the later stages of the disorder, and it may then only exist as a dull aching felt in the epigastric region, or in the back.³ It is, however, often of intense severity, and is described as burning, tearing, or lancinating;⁴ but this latter character is not always observed. There are, not unfrequently, complete intermissions in its appearance, which may last over many

¹ This author records a case where the anorexia was only manifested by a sudden disrelish for tobacco in an habitual smoker, but which, combined with a cachectic appearance, induced both the patient's attendant and himself to diagnose the existence of cancer, which was shortly after verified.

² Lebert says that it occurs in five-sixths, and Brinton in 92 per cent. of the cases which they have collected.

³ As in a case by Sir T. Watson, where the pain was obscurely seated in the lumbar region, giving rise to the suspicion of renal calculus, but also resembling lumbago.

⁴ Authorities are divided in their statements regarding this character of the pain. Bamberger, Lebert, and Brinton speak of it as being frequent; Walshe, Andral, Henech, though affirming its occasional occurrence, deny its comparative frequency.

days, or even weeks; in other instances, even when the pain is of great severity, it may be nearly continuous. In some cases it may occur in paroxysms of considerable severity, resembling attacks of cardialgia, or even colic, obliging the patient to double himself up for many hours, and it may occur in this manner, unattended by other symptoms, for years.¹ These attacks are not, however, so frequent in cancer as in ulcer of the stomach, and the character and intensity of the pain are influenced by the occurrence of ulcerations, by the invasion of large branches of nerves,² by the position of the ulcerated tumour, and by the extent of surface affected.

In site it may either be localized, or it may extend through the whole epigastric region. It is often felt in the back behind the scapulæ and in the course of the spine.³ It is sometimes, especially when a tumour can be felt, associated with distinct tenderness on pressure over the site of the growth, which is more marked in proportion to the superficial character of the latter, though this symptom is not unfrequently absent.

The pain is commonly, at least in the later stages, aggravated by the ingestion of food; but in the earlier periods of the disease this relation is not so distinctly observed as in cases of ulceration, nor is the pain so commonly relieved by vomiting.

Vomiting, though less constant, and usually appearing later than pain, is, however, a symptom of great frequency, being recorded, according to Brinton, in $87\frac{1}{2}$ per cent. of all cases.

It is most frequent when there is ulceration of the surface, or obstruction of the orifices by the tumour; but that it does not depend exclusively on either of these conditions is shown by its absence in some cases where they have both been found, and by its presence in others in early stages of this disease, and when neither exist.⁴ Its appearance under the latter circumstances is probably due to the direct irritation of the excito-motor nerves of the organ by the progress of the growth, and to the same influence must be

¹ The case of the first Napoleon is an instance of this. One presenting very similar characters has come under my own observation.

² As in a case by Sir T. Watson.

³ Brinton says that he has observed scapular pain in cases of cancer of the cardia, and pain in the lower dorsal and lumbar region, when the growth has been found on the posterior surface of the stomach.

⁴ Lebert. See also a case by Dittrich, loc. cit., p. 114, where there was almost complete scirrhus degeneration of the coats of the whole organ, and yet vomiting was absent. I have met with a similar case.

attributed its occurrence in those cases when it has been excited by pressure on the tumour (Lebert).

The period at which it follows eating is generally influenced by the position of the cancer. When the cardia is obstructed, the food is usually rejected immediately after deglutition, unless the return is delayed by dilatation of the oesophagus. When the pylorus is the seat of the disease, food may be retained for some time before it is returned.¹

Occasionally, however, vomiting occurs when the stomach is empty, and this is sometimes observed in the morning, when mucus is usually brought up—a symptom possibly referable to coexistent gastric catarrh.

Its frequency usually increases with the progress of the disease, but long intermissions between the attacks are common in all stages. The intervals also tend to become longer when dilatation of the stomach has ensued in consequence of obstruction of the pylorus; but when vomiting occurs under these circumstances, enormous quantities of acid and fermenting food are rejected from the stomach.

In some cases vomiting, which has been frequent in the earlier stages, may almost entirely cease towards its close—a change which has been occasionally traced to the pyloric orifice again becoming opened by ulceration.

The matters vomited vary. Mucus has already been alluded to, and the ejection of an acid fluid apparently derived from hypersecretion is not very uncommon.² When there is an obstruction at the cardia, the food is returned but little altered, and merely macerated and covered with a layer of mucus. When the pylorus is obstructed, food undergoes the changes before noticed, and sarcinæ and torulæ are often found in the yeast-scum which forms on the surface. In fact, though sarcinæ occur in the matters vomited in a great number of stomach affections, their presence is more frequently observed in cases of cancer of the pylorus than in

¹ The act of vomiting does not appear to be determined by the position of the tumour, independently of the obstructions to which it may give rise. See Lebert, p 505.

² Golding Bird states that in a case of scirrhus of the pylorus, where the patient vomited several pints of fluid in the twenty-four hours, he found a "quantity of free hydrochloric acid, equal in each pint to 22 grammes of pharmaceutical acid, in addition to a considerable quantity of some organic acid (lactic?), sufficient to neutralize nearly 7 grains of pure potash; at another time the hydrochloric acid nearly disappeared, and the quantities of organic acid in each pint required for saturation nearly 17 grains of the alkali."—*Urinary Deposits*, 1857, p. 162.

any other single disease to which the organ is liable. Cancer cells, also, are said to have been met with in the ejected matters, but the cases in which their distinctive features can be recognized must be extremely rare.¹ When sloughing action is taking place, in the cancer, the vomited matters and the eructations may be offensive, but this is in some measure prevented by the antiseptic action of the gastric juice.

Hiccough sometimes forms a very distressing symptom, which, however, usually only appears with any severity towards the close of these cases.²

Hemorrhage to a greater or less degree occurs, according to the statements of Lebert and Brinton, in nearly one-half of the recorded cases of this disease. It may be divided into two classes: slight, when only small amounts of rusty, sooty, or chocolate tinted specks appear in the matters vomited; and larger losses of blood, in which pints may be ejected.

The former class is more frequent in cancer than in ulcer, since in addition to the congested condition of the mucous membrane surrounding the tumour, in which varicose veins have sometimes been observed (Andral), the capillary vessels on the surface of the tumours are liable to bleed, a tendency especially noticed in fungating excrescences.³

This form usually appears in the early stages of the disorder, while the larger hemorrhages are usually associated with rapid sloughing destructive processes, and, in contrast to the other variety, they are less frequent in cancerous than in simple ulcerative disease. The symptoms of the larger hemorrhages are similar to those observed during the progress of simple ulcer; and in these also the blood may escape by stool, and may give rise to *malæna* and *diarrhœa*.

The discovery of a tumour forms one of the most important elements in the recognition of the nature of the disease. From the returns of Brinton and Lebert, it may be felt in from 70 to 80 per cent. of all cases observed, and, even when not distinctly

¹ See *ante*.

² Bamberger has observed that it is not caused by implication of the diaphragm, but is more often connected with extension of the growth to the peritoneal surface of the stomach.

³ Hence these rusty coffee-ground vomitings, though common to both disorders, were regarded before the time of Cruveilhier (who showed that they also took place in ulcer) as peculiarly characteristic of cancer of the stomach.

perceptible, there is often an induration associated with dullness of percussion note over some portion of the regions occupied by the stomach. The position of the tumour necessarily influences the facility with which it is detected by physical examination, and those in the cardia or in the posterior wall may occasionally elude observation.

The period at which it may be felt externally is usually secondary in point of time to other symptoms of the disease; but this, again, depends in great measure on the position in which it is developed. Its site is usually at the epigastric region, or (from the comparative frequency with which the pylorus is affected) in the right hypochondrium. Brinton states, that in the female sex it may be found in the umbilical region in nearly two-thirds of all cases in which it is discoverable—a peculiarity due, in a great measure, to the effects of the compression of the lower part of the thorax by stays. Similar displacements, common to both sexes, may be due to the weight of the tumour dragging down the pyloric end of the stomach, when this is not retained by adhesions in its original site. The tumour feels hard and irregular to the hand, especially when it is large and situated near the anterior surface; it is generally immovable by manipulation, but alters its position through distension of the stomach by food, or by gradually increasing dilatation of the viscus. Sometimes it may disappear entirely for many days, either from the twisting of the stomach upon its axis, by which the pylorus is brought below the liver, or from its being covered by a distended colon. In some cases, Brinton thinks that its complete disappearance may be due to sloughing and destruction of the growth. Pulsation in the tumour is not uncommonly observed, due, probably, in most cases, to an impulse derived from the abdominal aorta. Instead of a circumscribed mass, the whole epigastric region may be hard, prominent, and resisting, and, in some cases, the form of portions of the stomach may become prominent through the abdominal wall¹—a condition which usually depends on extensive infiltration of the coats of the stomach by the cancerous growth. In these cases the percussion note, instead of being absolutely dull, may have a muffled tympanitic resonance; a peculiar tinkling sound has also sometimes been heard when liquids are swallowed, arising from the fall of the fluid into the dense cavity (Bamberger).

¹ Louis, *Mem. Anat. Path.* 130, quoted by Dr. Walshe.

The signs of contraction or distension in the stomach consequent upon pyloric or cardiac stenosis will be given under the head of these affections.

The tongue presents but few characteristic features. Its appearance is not necessarily affected by the cancer, and the varieties of fur, aphthæ, etc., occasionally observed, depend more on the general condition of the patient, and especially on the coexistence or absence of a catarrhal condition of the mucous membrane. An excessive salivation, with characters similar to those observed in ulcer, has been sometimes noticed.

The cachexia in cancer of the stomach very frequently presents the most characteristic features of this disease. It sometimes appears early in the disorder, though its progress is usually proportioned to the severity of the vomiting, hemorrhage, pain, and disturbances of digestion. In the early stages, however, and even sometimes at an advanced period, there may be very little external evidence of disturbance of health.

When the cachexia becomes marked, the face is pale and sunken, with deepening of the naso-labial wrinkles. The expression is anxious and careworn, or indicative of pain. The skin acquires an opaque earthy tint, which is equally marked in fair as in dark-complexioned people; in other cases, and particularly when hemorrhage has occurred, it has the waxy look of extreme anæmia. It is often dry and rough from the desquamation of the cuticle and from the want of perspiration. Jaundice or a straw-coloured icteroid tint of skin is not uncommon. The lighter shades of jaundice are rather more frequent; the severer cases depend on pressure by the growth in the stomach on the common bile duct, or on secondary formations in the liver.

Edema often appears towards the close of the complaint, arising either from the general hydræmia, or limited to one of the lower extremities, through venous obstruction from thrombosis. Ascites is also occasionally, but not constantly, observed; its occurrence depends either on the pressure exercised by the tumour on the portal vein, or on cancerous formations in the peritoneum, of which latter cause the most frequent examples are afforded, in proportion to their number, by the extensions of the colloid variety. Obstructions of the arterial circulation, either by thrombosis or embolism, are also occasionally observed; they then give rise to intense pain in the limb affected, with burning or cramp-like sensations, and

sometimes to great temporary hyperæsthesia of the skin, which, at a later period, are followed by gangrene of the part below the seat of obstruction.

Febrile reaction is the exception rather than the rule, but it is sometimes very distinctly marked, and especially towards the close of the complaint.¹ Its occurrence is frequently due to some secondary inflammatory action, among which pneumonia, associated either with cancerous deposits in the lung, or of the hypostatic variety, is one of the most frequent causes.

Emaciation and loss of strength usually progress rapidly from the first outset of the severer symptoms, though occasionally the nutrition and general vigour are maintained for a year or eighteen months (Lebert). In many cases, however, these symptoms are among the most prominent present; and there are few in which, towards the close, marasmus does not form a very marked feature; while in others, even at the commencement, and while the other symptoms are still obscure, the presence of these signs may, as has been before noticed, form valuable indications of the nature of the disease.

THE DURATION of the disease, regarded from the origin of the cancerous growth, is very indefinite; in fact, it appears impossible in all cases to fix the period of its commencement. The length of time during which some patients have suffered from even severe pain (as in the case of Napoleon, in whom this symptom occurred at intervals for nine years before his death—Abercrombie) points to the probability that the disease may occasionally persist long, without much disturbance of the general health, or of the functions of the stomach. Ordinarily this period of comparative latency rarely extends beyond two or three months, though it has been known to last for a year and a half (Lebert).

The average duration is estimated by Dr. Brinton, from 198 cases, as amounting to 12½ months, which corresponds pretty closely with the results obtained from smaller numbers by Lebert and Valleix. The minimum course which I can find recorded is one of four months (Valleix). The longest period which has been known to elapse from the first distinctive symptom to a fatal termination has been three years and a half.

¹ I have, however, known febrile action, due apparently to an abscess formed behind the stomach, persist during nearly two months.

PROGNOSIS.—The termination has been invariably fatal; only very untrustworthy evidence has been afforded of the cure of the growth by enucleation and cicatrization; and evidences derived from cicatrices are uncertain, as we can never exclude the possibility of their having resulted from chronic ulcer (which has been shown to be a more common disease than cancer); nor can the same probability in favour of their origin from simple ulcers be denied in those instances where a cancer and cicatrices have been found coexistent in the same stomach.

Cancer, it is known, possesses the destructive peculiarity that it is never circumscribed, but that the tissue around its margin is constantly found presenting more or less evident perversions of development with structures analogous to those of the morbid growth. In the presence, therefore, of the direct clinical experience which the course of the disease constantly affords us, and owing to the fallacious resemblance between its symptoms and those of ulcer, the evidence of the possibility of its cure must be established by more direct proof than has hitherto been furnished, or than the circumstances attending its formation in this position appear capable of affording, before this can be admitted, even on hypothetical grounds, to alleviate in any way the gloomy prognosis to which its recognition must always give rise.

The probability of a rapid course is determined by the severity of the vomiting and hemorrhage. Lebert considers early vomiting an unfavourable symptom. Cases exhibiting it have frequently terminated fatally in from four to six months.

PATHOLOGY.—The pathology of the disease will only be treated of in this place in relation to special anatomical peculiarities affecting the organ.

The growth occurs in all the known forms assumed by cancer in the order of frequency here enumerated: scirrhus; medullary (and combinations of these); colloid, either simple or combined with either of the above; villous; and melanoid. Of these, scirrhus is found in nearly three-fourths of the whole number,¹ but it is seldom unattended by softer portions on the surface or margins, which approximate in their structure and character to the medullary type.

The seat of the cancer is, in the majority of cases, in the pyloric

¹ Brinton, from 180 cases.

region.¹ The cardia, from Brinton's and Lebert's returns, only appears to suffer in about 10 per cent. of all cases. Extensions beyond the pylorus to the duodenum are extremely rare;² but when the pylorus is affected, the cancer usually extends around the whole circumference of the valve, and thence invades the smaller curvature. When the cardia is affected, the growth is generally, but not constantly, found to extend into the lower part of the œsophagus. The proportion of all cases in which the orifices taken collectively are affected amounts to 71 per cent.; an excess in these parts, which, as Brinton has pointed out, is considerably greater than that observed in cases of simple ulcers.

Cases where large tracts of the stomach are invaded are usually those where the cancer is of a colloid variety, but it is occasionally noticed in other forms.³

The growth, when of the scirrhus or medullary forms, almost invariably takes its origin in the submucous tissue. It has been found, however, by Dittrich,⁴ commencing in the subserous cellular tissue.⁵ The development of the colloid form will be more particularly alluded to hereafter.

The special forms are each connected with some anatomical peculiarities, which require a separate description.

Scirrhus of the stomach presents the same contracting, indurating characters that distinguish the growth in other parts. Commencing, as just stated, in the submucous tissue, it thence extends in about equal degrees into the mucous membrane, and also into the muscular coats. The invasion of the mucous membrane is frequently marked by striated radiating lines of a cicatricial appearance, attended with destruction and atrophy of the glandular textures, and induration of this coat, and sometimes by retractions and depressions of portions of the, as yet, unbroken surface. The true mucous structure (viz., the glands and villi), however, often resists during a long period the cancerous encroachment, although the membrane early becomes fixed and immovable upon the submucous tissue.

¹ Of 360 cases Brinton found that this was affected in 60 per cent.; Lebert, 34 times in 57 cases.

² Cases in which this has occurred have been recorded both by Lebert and by Brinton.

³ Brinton in 360 cases has found 13 in which the whole stomach was found thus degenerated.

⁴ Prager Viertel-Jahresch., xvii. p. 6.

⁵ In some of these cases this author has observed a scirrhus degeneration of this layer, together with a medullary growth in the submucous tissue, the intervening muscular coat having been unaffected.

Through the character of the growth, in which as elsewhere the fibrous stroma greatly predominates over the cellular elements, the parts affected by it become converted into a firm, unyielding mass, in which all their distinctive features are lost. When large tracts are thus affected, the disease may at first sight present a great resemblance to fibrous thickening, or to hypertrophy of the coats of the organ.¹

The invasion of the muscular tissue by the growth takes place, as pointed out by Rokitsanski, in the intermuscular septa, which form meshes inclosing spaces containing unaffected muscular fibre. The portions thus included present a reddish or a semi-transparent appearance, and their histological elements are at first greatly enlarged, but subsequently degenerate into the cancer structures.

The effect of these changes is to produce great contraction of the parts in which they occur. Either at the pylorus or cardia the immediate result is an extreme narrowing of their openings, which is often heightened by irregular masses protruding at the surface, and by polypoid vegetations, which, though less common than in the medullary variety, sometimes accompany scirrhus cancer.

When large tracts of the coats are thus invaded, the stomach may be externally shrunken and contracted, so as to resemble a fowl's gizzard in appearance,² with dense inflexible walls, which may even attain the thickness of an inch. The small curvature may be so shortened as to bring the pylorus and cardia into close proximity, and the inner surfaces of the interior and posterior walls may be almost completely in contact.³

Medullary cancer, commencing in the same tissues as the scirrhus variety, appears usually in the form of nodules, in masses of vary-

¹ The diagnosis between these two alterations is not always an easy one, since, as in other parts affected by scirrhus, large tracts of tissue may often be found presenting nothing but a dense fibrous structure, and devoid of the cell-structures which are usually found in the more open meshes of the stroma, though these, as pointed out by Rokitsanski, can usually be found at the margins of the growth. In addition to the cancerous character of the margin, the scirrhus growth is also distinguished by its affecting all coats equally, by their fusion into a uniform mass of pearly whiteness, and presenting the gristly cartilaginous texture characteristic of this form, by the immovability, except at the earliest stages, of the mucous membrane upon the tissues beneath, and by the destruction of the normal appearances of the muscular layer. Two cases exhibiting the contrast of these forms are recorded by Dr. Wilks, *Path. Soc. Trans.*, x. 136, xiii. 83.

² As in a specimen cited by Dr. Walshe.

³ Dittrich. In one such case the mucous membrane was found smooth and shining, as if from the effects of attrition; but later it may become the seat of ulcerations hereafter to be described.

ing degrees of softness, and of a cerebriiform appearance; more rarely it occurs as an infiltration of the different coats.

Though the peritoneum suffers with less frequency, the mucous membrane is invaded with greater rapidity by medullary than by scirrhus cancer. The nodules, when seen on the external surface, present, with the exception of their softness and cerebriiform appearance, very few peculiarities. In some cases the growth on the mucous membrane tends to form large fungating excrescences, in which an exaggeration of the villous type is observable. These constitute the varieties of the so called villous cancer, which may sometimes form large tumours, thickly covered with the hypertrophied villi.¹

The melanoid form is very rarely observed.² In some cases it appears as small scattered nodules in or under the mucous membrane, which present the ordinary characters of medullary cancer, with the exception that their cell structures are loaded with melanin pigment.

The colloid or gum cancer has its most frequent seat in the stomach, but even here it is not of comparatively frequent occurrence.³ Its site of origin appears to be rather more doubtful than in the case with the other growths before alluded to. Some authors state that it begins in the submucous tissue, others in the subserous.⁴ My own opinion, which I would however state with some hesitation, is that this variety of "cancer" is essentially of glandular origin, and akin to those forms of epithelioma of the skin described by Remak,⁵ which commence with heterologous extension of the sebaceous and sudoriparous glands into the deeper structures.⁶

¹ Their structure can be very well seen when examined under water. Each villus contains a loop of vessels, and the larger ones are usually filled with cancer cells. The delicacy of the structure of the capillary walls, which are often only covered by a single layer of epithelium, and the softness of the whole growth, together with its extreme vascularity, render this variety a dangerous source of hemorrhage.

² Only three times in 180 cases, Brinton; once in 160 cases, Dittrich. In Dittrich's case it was coincident with a general dissemination of melanoid tumours throughout the body.

³ In 180 cases of Dr. Brinton's, colloid was found 17 times. In 160 of Dittrich's it only occurred in 11 specimens, and in three only of these was it uncombined with either scirrhus or medullary growths.

⁴ Brinton, loc. cit., 239.

⁵ Deutsche Klinik, 1854, p. 70 et seq.

⁶ I must state, that since my attention has been devoted to this question I have only had an opportunity within the past four years of examining one recent specimen, in which, however, the glandular origin was most distinct; and my observation on preparations preserved in spirit has, though not conclusive, tended to confirm this view. In the former case there was a distinct colloid mass ob-

It is possible that, when apparently commencing in the deeper coats, this growth may, under such circumstances, take origin in the little glandular masses which occasionally are found in these parts, having no connection with the rest of the mucous membrane, and of which I have seen some examples.¹ However originating, this form of cancer tends to spread over large surfaces of the mucous membrane, which is thus greatly thickened, and has its normal texture converted into a reticular structure, with spaces filled with "colloid" material. Its tendency to invade deeper tissues is also very considerable, and it frequently extends to the peritoneal surface, and thence to the omentum.

In their subsequent course all cancers of the stomach have certain characters in common, marked only by minor shades of variation dependent on their peculiarities of growth.

Changes in the form of the stomach from the contraction of scirrhus have been already alluded to. Diminution in the size of the organ may also occur from obstruction of the cardiac orifice. Dilatation is a very common effect of obstruction of the pyloric orifice; and it is sometimes attended with thickening, at others with thinning of the coats. Thickening when present usually predominates in the muscular layers, which then undergo a true hypertrophy. The size attained under these circumstances by the organ is sometimes such as to fill the whole abdominal cavity, and to extend even to the pubes.

structing the pylorus, unassociated with any other form of cancer in the stomach, though attended with many polypoid growths from the mucous membrane. Two points of great interest in connection with it were the association with an ordinary epithelioma of the lower third of the œsophagus, which did not show traces of glandular origin, and which was attended by secondary epithelioma of the mediastinal lymphatics; while in the retroperitoneal lymphatic glands, which lay immediately before the diaphragm (and had probably therefore been infected directly from the stomach), I found distinct masses of a medullary character. I think it very possible that the secreting glands of the stomach may undergo this abnormal development in cases where the primary disease has been a scirrhus or medullary growth of the submucous tissue, but I doubt whether any direct *metamorphosis* can take place from either scirrhus or medullary cancer into the colloid variety. A glandular tumour of the pylorus having a structure very similar to what I observed in the case of colloid just quoted, is figured by Dr. Hughes Bennett, Clin. Lect. 1865, p. 495. Its structure is, however, described as thickened, indurated, and white.

¹ These are mentioned by Rokitsanski; the largest growth of this kind which I can find recorded is by Loeschner and Lambi, *Berichte aus dem Franz Joseph Kinder Spital*. That glandular growths may assume all the characters of "malignant" structures is shown by Remak's observations above quoted, as well as by a remarkable case of Billroth, of a tumour of this nature in the testicle (*Virch. Archiv*, viii.). The best illustration of this form of cancer is to be found in Cruveilhier's *Path. Anat.*, Liv. x.

Adhesions are very common to adjacent viscera when the cancer has extended through the peritoneal coat. The most common of these are to the liver, pancreas, omentum, spleen, or diaphragm, or to the abdominal wall.

Displacements, unless prevented by adhesions to neighbouring viscera, may be caused by the weight of the tumour dragging the stomach into the lower portions of the abdomen; and under these circumstances it may become fixed by new adhesions in abnormal situations, and the pyloric portion may be found in the right iliac fossa, or even in the pelvis, adhering to the intestines, uterus, ovaries, or bladder.

Ulceration is common to all varieties of cancer. It is most marked in the softer medullary forms, when it often takes on the form of sloughing, through which process large masses may sometimes be thrown off, leaving irregularities in the substance of the cancer. The same condition also occurs, but to a less extent, in scirrhus. In colloid, on the other hand, it is seldom observed, and the ulcerative process, if so it can be called in this variety, consists of the rupture of the larger spaces, which thus give rise to a series of pits or depressions on the surface. The more rapid and extensive necrotic processes are sometimes a source of dangerous hemorrhage.

The ulcers thus resulting are almost invariably distinguishable by their thickened, ragged edge, which is infiltrated and swollen by the morbid growth, and around which warty or polypoid excrescences are often formed, and also by the presence of cancer structures in their floor. Occasionally such large masses of the growth are thrown off as to have led to the idea that the morbid structure might possibly be eliminated in this manner; but evidence of a cure thus occurring is very defective, and, although cicatricial formation is sometimes found proceeding in one part, it is usually found that the cancer structures are extending in another. In some cases this sloughing action appears, however, to have restored the patency of the pyloric and cardiac orifices, after these had been previously obstructed by the growth.

The extension of the cancer through the peritoneal coat is attended with various consequences. Adhesions to neighbouring organs, and implications of the omentum in the cancerous growth, which are most common in cases of colloid, have been already alluded to.

General peritonitis¹ has sometimes been observed without rupture of the stomach. Partial peritonitis taking place in the same manner is, however, more common.

Perforation, leading to a free opening between the interior of the stomach and the cavity of the peritoneum, is less frequent in cancer than in ulcer of the stomach. The data as to the absolute frequency of this event in the former disease are, however, not sufficiently certain to allow of an absolute comparison.²

Adhesions to adjacent organs may, however, lead to the invasion of these by the cancer, as is observed in the case of the liver, pancreas, spleen, and the lumbar vertebræ, or to fistulous communications formed between the stomach and other parts. Gastro colic fistula has been already stated to be much more frequent in cancer than in ulcer, while the converse proposition holds true with regard to gastro-cutaneous fistula.³ Perforation of other portions of the intestines has also been noticed, as into the ileum;⁴ and in other cases the growth extends through the diaphragm into the lungs.

The mucous membrane of the stomach in parts not invaded by cancer presents little that is characteristic. Evidences, however, of inflammatory action, sometimes existing in an acute form, are occasionally met with, and still more frequently there are seen signs of chronic forms of this process in thickenings and ash-gray pigmentation, with fatty degeneration of the glandular structures. In other cases, again, no déviations from the normal appearance and structure can be found.

The associated pathology of cancer of the stomach may be conveniently considered under the heads of the relation of the growth to similar structures occurring in other parts, and of accidental complications and secondary lesions not associated with the presence of cancerous formation.

The disease in the stomach, unless when propagated by con-

¹ Dittrich, loc. cit.

² Dr. Brinton has estimated the frequency of perforation in cancer as occurring in rather more than 4 per cent. In four of his cases the contents of the stomach were effused into a limited sac bounded by the peritoneum.

³ See note 6, p. 191.

⁴ Brinton, loc. cit. A remarkable case of this nature, which has its parallel among the secondary consequences of simple ulcer, is recorded by Dittrich, *Prager Viertel-Jahresch.*, xix. 112, where a fistulous opening was established between the stomach and duodenum after the pyloric opening had been obstructed by the cancerous growth.

tinuity from other parts, is almost invariably primary.¹ Secondary affections² more commonly occur in the viscera of the abdomen than in more distant organs.³ The extension of the growth to other adjacent viscera by adhesions has been already described.⁴

Obstructions of the vena cava and thoracic duct are among the rarer events.⁵

The non-cancerous secondary lesions may be also briefly dismissed, as they offer but few peculiarities in connection with the special organ in question. The occurrence of peritonitis, independently of rupture of the stomach, has been already alluded to. It appears, from the observations of Dittrich, to be sometimes of a septic character, and to be occasionally associated with pleurisy and pericarditis, due probably to a similar mode of origin. Retrograde tubercle was found in the lungs in most of Dittrich's cases. This author only mentions five instances of catarrhal pneumonia as a complication; but it is probable, from the statements of numerous other writers (though precise data are wanting), that a low inflammation of this type is exceedingly common, and frequently proves the immediate cause of the fatal issue. Among the other secondary affections may be mentioned coagulation of the blood in the veins of the extremities, with the phenomena of phlegmasia dolens;⁶ or in the sinuses of the dura mater. Spontaneous coagulation in the

¹ Walshe, loc. cit., 279. It may occur among the phenomena of simultaneous multiple developments of the growth, and under these circumstances has been found to coexist with similar disease in the ovaries and uterus. An almost unique case has been recorded by Cohnheim (Virch. Archiv, xxxviii. p. 142), when cancer was found in the stomach secondarily to a similar affection of the mamma. The liver and the axillary and cervical lymphatics were also implicated.

² These are found in about half of the cases of cancer of the stomach. The liver suffers in 25.6 per cent. of all cases (Brinton, Dittrich). In 160 cases given by Dittrich, the liver was affected 43 times; the peritoneum 22; the lungs 9; the rectum 2; and the ovary once. Brinton says that the lungs were affected in 8½ per cent., and the gastro-lymphatic glands in 25½ per cent., of 251 cases. Dittrich says of the latter, that it is only those in immediate proximity to the stomach which ordinarily suffer. Hencoh, loc. cit., ii. 162, says that cancerous glands above the clavicle may sometimes aid in the diagnosis. Dr. Handfield Jones, loc. cit., 169, has given a case where the glands behind the stomach thus secondarily implicated contained columnar epithelium.

³ Dr. Walshe says that he has never known the lungs to suffer in this manner without implication of the liver.

⁴ In some cases the disease appears to spread by dissemination or contact, without adhesion, as in a case of Sir R. Carswell's, cited by Dr. Walshe, loc. cit., p. 282, where a cancerous tumour existed in the anterior abdominal wall, over, but otherwise unconnected with, a similar formation in the pylorus; and an illustration of a similar and very extensive process of dissemination over the peritoneal surface is given by Virchow, Krankhaften Geschwülste, i. 54.

⁵ Dittrich, loc. cit.

⁶ Nine times in 160 cases: Dittrich.

arteries¹ is a less frequent occurrence. Its consequences have been already alluded to.

Ulcerations of a non-cancerous nature in the rectum and colon were noted twenty-five times by Dittrich, and endocarditis was observed in five instances.

The blood suffers markedly in its composition, especially when there is much vomiting, and still more so when there is hemorrhage. The anæmia and waxy pallor of the complexion are largely explicable by these events; but that the interference with digestion and assimilation may take place at an earlier stage is shown by cachexia occurring, in a certain number of cases, independently of these events. Analyses of the blood have chiefly been directed to the former class, and show, as might be expected, a diminution in the number of the blood-corpuscles, and also of the total amount of solids in the serum, while the proportions of fibrine have varied, being sometimes in excess of, and at others below, the normal standard.²

DIAGNOSIS.—Cases of cancer of the stomach may be, as has been before stated, divided into two classes—one when the disorder runs an almost latent course, and is revealed only by failure of health and strength, by obscure dyspeptic symptoms, and by anorexia: another when it gives rise to either pain, vomiting, and hemorrhage, singly or conjointly, and in which, at some period, a tumour can be recognized.

The former of these classes is with great difficulty distinguished from cases of atonic dyspepsia, and from some of chronic catarrh. The latter may be confounded with neuralgic conditions of the stomach, with colic, or with gastric ulcer.

It may be stated that the discovery of tumour distinctly situated in the stomach affords the only *positive* ground for the diagnosis of cancer from some other diseases of the organ. This, however, is not early apparent, and it may at times disappear, and the probability of the cancerous nature of the disease must then rest upon other data, which relatively are only of comparative value.

1. The diagnosis of the first class has been already alluded to (see Atonic Dyspepsia). The etiological conditions under which

¹ Twice in 160 cases: Dittrich.

² Andral et Gavarret, Rech. sur la Composition du Sang, p. 238. I have in one case observed a distinct increase of the white corpuscles of the blood, but there was in this instance a considerable non-cancerous enlargement of the spleen.

the symptoms originate are of extreme importance in estimating the nature of the disorder. If such a condition should appear without manifest cause after the age of thirty-five or forty, it is sufficient to excite suspicions of its real nature, especially if loss of appetite form a prominent feature. The addition of vomiting to the above, even if unaccompanied by pain, when alcoholic excesses, albuminuria, or cirrhosis of the liver can be excluded, would add additional gravity to the suspicions entertained, since both atonic dyspepsia and simple chronic catarrh are rarely associated with this symptom, except (in the case of the latter) under some of these attendant circumstances.

2. In cases where pain forms a prominent feature, unaccompanied by vomiting, by marked disturbance of the digestion, or by hemorrhage, and when no tumour can be discovered, the diagnosis from *purely neuralgic conditions* must also mainly depend on etiological circumstances, since the characters of the pain in both these classes of disease bear a great similarity to one another, being in both usually unaggravated by food, and not associated with tenderness on pressure. Sex is one of the most important of these; sex and age collectively may, in cases where the combination occurs in a male past middle life, be of great importance, for neuralgic pains of the stomach are rare under these circumstances, being most common in females at the earlier periods of life. In the female sex these conditions afford less assistance. When the climacteric period is past, and the hysterical diathesis can be excluded, there may, under such circumstances, be some grounds of suspicion, but certainty can rarely be attained without some of the concomitant phenomena before alluded to.¹

3. A third class, of gradual and progressive emaciation, without distinct causes of marasmus, occurring at middle life, though unattended by any distinct stomach symptoms, should also engage attention. The manner in which cancer of the stomach can thus profoundly impair the nutritive processes, though completely unexplained,² has nevertheless been distinctly recognized.

4. In the absence of a tumour, the diagnosis of cancer from *ulcer* of the stomach is sometimes a question of difficulty. In the

¹ Constant and repeated experience has shown that such cases are not merely hypothetical.

² The condition is evidently something more than the so-called cancerous cachexia, which is rarely, if ever, observed in cancer of external parts until ulceration has set in, or unless pain has been severe.

majority of such cases the diagnosis is rather a balance of probabilities than a question of absolute certainty, which, however, may be attained with a greater or less accuracy in a certain proportion of instances.

Common to both diseases are the symptoms of pain, vomiting, hemorrhage, and cachexia, and disturbances of digestion and of the secretions of the stomach, but they appear in a different manner, and at different periods of the two disorders.

The circumstances influencing the diagnosis may be briefly contrasted as follows:—

Etiology.—Ulcer is more common at the earlier periods of life, and especially so in the female sex: cancer is almost limited to the later periods of life, and its appearance is comparatively uninfluenced by sexual conditions. The pain frequently presents in both disorders a paroxysmal character, but in cases of cancer it is usually more continuous, is less influenced by food, and is less frequently relieved by vomiting. The specific character of the pain affords no positive data for distinction in either disease.

Tenderness on pressure is most common in earlier stages of ulcer. It is rarer in a localized form in cancer until a tumour has appeared, and even under these circumstances it is less distinct. The position of either disease in the stomach necessarily influences the diagnosis in this respect.

Hemorrhage is, on the whole, rather more frequent in cancer than ulcer, but the amount of blood effused varies considerably in the two disorders. Large hemorrhages are much the most frequent in ulcer,¹ while smaller hemorrhages of coffee-ground or sooty matter mixed with mucus are most common in cancer. Hemorrhages in the earlier stages are much rarer in cases of cancer than of ulcer. Hence, in any given case, the entire absence of hemorrhage is somewhat in favour of ulcer; the presence of small hemorrhage alone is in favour of cancer; and the presence of large hemorrhage alone, or occurring early in the disease, is in favour of ulcer.

Cachexia and failure of strength is a much earlier symptom in cancer than in ulcer. In the latter it is usually proportioned to the pain, hemorrhage, or vomiting; in the former it occurs more or less independently of these conditions. The character of the cachexia appears *per se* to offer but few positive criteria.

¹ They occur in one-third of all cases of ulcer, and in only about 1 per cent. of cases of cancer (Brinton).

The appetite often presents a marked difference. It is often absent or capricious in cancer; in ulcer, on the other hand, it is frequently excessive.

Pyrosis and acidity, and the vomiting of glairy mucus, and conditions of indigestion, flatulency, and constipation, are common to both diseases, and offer but few distinctions, but they are somewhat more distinct in the early stages of cancer than of ulcer.

The duration and course of the two disorders are, however, markedly different. That of ulcer may be almost indefinite. It is interrupted by long intermissions, and seldom presents a distinct uniform deterioration of the health and strength. The progress of cancer, on the other hand, from the period that the more distinct symptoms have declared themselves, is rapid, tending to a fatal issue within one or two years. The intermissions, also, when they occur, are of shorter duration, and are seldom complete. Exceptional instances at times occur, but they are insufficient to invalidate the general rule observed.

Perforation of the colon is, as before stated, in favour of the cancerous nature of the disease.

Dilatation of the stomach and obstruction of the orifices, together with the vomiting of sarcinae, when occurring to any marked extent are more common in cancer than in ulcer; but this, like other points of comparison, is only true as a question of degree.

5. After the appearance of a tumour, the diagnosis becomes more definite; the fallacies, however, of its position and occasional disappearance, which have been before alluded to, require to be recollected. Ulcers of the anterior surface and of the pyloric extremity are occasionally attended with a degree of thickening, which may give rise to a fallacious sensation of a tumour; but in these cases the induration is not so distinctly circumscribed, nor is the resonance on percussion so absolutely dull, as in cases of gastric cancer. The other peculiarities arising from the infiltration of the coats in the latter disease have been before described.

Other fallacies, however, exist in cases of cancerous tumours of the lymphatics, of the small omentum, of the liver, of the head of the pancreas, and of the peritoneum and great omentum, which may at times perforate the stomach from without. When this event does not occur, the diagnosis must depend on the absence of the more prominent symptoms referable to the stomach; if the stomach is implicated, the diagnosis must become practically almost

impossible without further details in the history of the case, which lie beyond the scope of this section.

It is only necessary to allude briefly to the possible fallacy of spasm of the first division of the rectus muscle simulating a tumour. This can be distinguished by its quadrangular shape, its superficial character, and by the resonance on percussion; which, however, is sometimes masked by the tension of the muscle.

6. The diagnosis of the pain of cancer of the stomach from attacks of *colic* is often, in its earlier stages, one of great difficulty. The distinction mainly depends upon the same data as serve to distinguish attacks of the latter affection from cases of ulcer (see p. 214).

THE TREATMENT of cancer of the stomach can, unfortunately, be only palliative. In their main features the indications are almost identical, both in diet and medicinal treatment, with those laid down for cases of ulcer; but as food has less influence on the pain, a rigid diet is not to be persisted in so strenuously, when it fails to relieve. Still, however, small meals of easily assimilable food, presented for the most part in a fluid form, prove in many cases very advantageous: a moderate use of alcoholic stimulants is, however, in most cases beneficial. For the relief of pain, opium is the most effectual remedy, and in some cases, when the growth has formed adhesions with the anterior wall, I have found hypodermic injections of morphia of great benefit. Fomentations, leeches, and even blisters to the epigastrium, are also of service. Vomiting is most effectually controlled by ice; but effervescent, hydrocyanic acid, and creasote may at other times be employed with advantage. Offensive eructations associated with sloughing of the tumour are often mitigated by the use of charcoal.

Dr. Walshe states that he has found a combination of trisnitrate of bismuth with extract of hop, conium, and stramonium in pill, more useful than any other medicine. He also recommends the oil of cajeput for the relief of flatulence. Constipation may be remedied by enemata, but purgatives by the mouth should be as far as practicable avoided.

The treatment of hemorrhage must be conducted on the principles already laid down. The vomiting of sarcinæ may at times be controlled by the administration of the alkaline hyposulphites.

VII.

HEMORRHAGE FROM THE STOMACH.

SYNONYM.—Hæmatemesis.

Hemorrhage from the stomach is usually only a symptom or a result of some other disease of the mucous membrane, or of a condition of congestion induced by disorders in the portal circulation by causes extrinsic to this viscus. It will only, therefore, be necessary to give a brief retrospect of these, many of which have been already alluded to.

Recent researches have indeed proved that the older theories of hemorrhage by exhalation are not altogether so incorrect as they have been lately believed to be, and that in cases of congestion from mechanical causes an escape of the blood-corpuscles from the capillaries is possible. In most cases, however, of this nature as affecting the stomach, the rupture of the minuter vessels of the mucous membrane must be regarded as the most probable condition; since the large hemorrhages arising from cirrhosis of the liver or diseases of the portal system can scarcely be explained by a simple transudation. The pallor of the mucous membrane found in some cases after death affords no argument against this explanation, nor does the fact that no source for the effused blood is discoverable. The causes of this post-mortem pallor, when congestion has pre-existed, have been already considered.

In some cases the rupture of the capillaries is associated with hemorrhagic erosions, the appearance of which has been already described.¹

Hemorrhages from the stomach may, therefore, be divided into two main classes, viz.: (a) those in which it proceeds from larger vessels, and (b) those in which it is derived from capillary sources.²

Perforation of large vessels may arise from mechanical causes,³

¹ See Dr. Bastian, Trans. Path. Soc., vol. xix. 1868.

² Another and rarer cause has been noticed in the bursting of an aneurism of the celiac axis into the stomach (Bamberger, loc. cit., 246).

³ As in the case of a cork swallowed; Velpeau, Mém. Acad. de Méd. (Budd, 277).

or from the rupture of vessels through atheromatous changes;¹ but the most frequent, if not the exclusive, sources of hemorrhage of this kind arise in the progress of the chronic ulcer and of cancer, to which no further allusion appears necessary.

Hemorrhage from congestion may arise when this is simple and passive. It is a very common complication of obstructions of the portal circulation, especially by cirrhosis or acute atrophy of the liver, or by thrombosis of the portal vein,² which are among the conditions which give rise to the largest hemorrhages from this cause, and some of which have been found attended by a varicose condition of the veins of the stomach. Disease of the heart and lungs, and asphyxiating conditions, such as epilepsy³ and strangulation, are also causes of hemorrhage less extensive in amount than those before cited. It is probably to obstructions in the portal, cardiac, or pulmonary circulation that the hæmatemesis and melæna of newly-born children are due, though in some cases the existence of a deficiency in the nutrition and elasticity of the capillaries is evidenced by the coexistence of a hemorrhagic diathesis, either hereditary or not.⁴

In other cases, also, there is probably, in addition to congestion, some alteration in the coats of the capillaries, as in diseases of the spleen, where, however, the mechanism of its origin is not fully explained.⁵ The occasional origin in lardaceous degenera-

¹ Copland, Med. Dict., ii. 93.

² For illustrations of all these forms, see Frerichs, Dis. of the Liver. An interesting case of hemorrhage, from portal thrombosis, is recorded by Dr. Andrew Clark, Path. Soc. Trans. 1867, p. 61.

³ Budd, loc. cit., 51; Yellowly, Med.-Chir. Trans., iv.

⁴ A very complete account of this affection is to be found in Barthez and Rilliet, *Malad. des Enfants*, ii. 309.

⁵ When the hemorrhage occurs in connection with disease of the spleen, it has usually been associated with enlargement of that organ, as the result of ague; but a case of hæmatemesis is given by Dr. Watson, *Edin. Med. Journ.*, June, 1858, where in addition to splenic enlargement there was an abnormal distribution of the splenic vein, together with an obstruction from phleboliths in its exterior. In a large number of these cases the liver is simultaneously diseased; but that this is not always present is shown by a case by Dr. Budd, loc. cit., p. 70. The cause in some cases is probably a complex one, for other hemorrhages, as into the skin (Piorry), or from the nose, which was noticed by Hippocrates (*Épidémies*, ii. § 165, Kuhn's ed., iii. 450), are very common. These have also been witnessed by recent observers, as by Bamberger, loc. cit., 654; and though it is difficult to believe that any alteration in the composition of the blood, except when attended with complete breaking down of the red corpuscles (which has not been shown to take place), can permit of its escape from the capillary walls, yet it is very probable that the nutrition of the vascular system may, in these cases, be so profoundly affected as to cause their easy rupture under slight pressure. In some cases, as believed by Siebert (Henoch, loc. cit., i. 54), the contractility of the

tions has been already alluded to.¹ In the same manner are probably produced the hemorrhages of yellow fever, and of other malignant intermittents, as also those which occur in relapsing fever,² typhus fever,³ cholera,⁴ purpura, scurvy, and hemorrhagic variola.

In other cases, though probably referable to the same source, its mode of origin is less explicable; as when it follows severe surgical operations,⁵ or blows upon the back or epigastrium,⁶ or even a remarkable case reported by Empis where the invasion of tubercular meningitis was associated with uncontrollable vomiting with hæmatemesis.⁷ In the same class belong also hæmatemeses, occurring vicariously, at the menstrual period, which, however, when independent of ulceration, seem to be less frequent than was at one time supposed.⁸ In other cases also, it may arise through the mechanism of embolism and thrombosis. (See Ulcer.)

DIAGNOSIS.—It must be recollected that blood vomited does not always proceed from the stomach, but may have been swallowed after having been effused from the nose, mouth, and throat, œsophagus or lungs. The characters vary with the amount and rapidity of the hemorrhage, and with the length of time which it has remained in the stomach.

splenic tissue may contribute to the result, as a rapid diminution of the size of the spleen has been observed after copious hemorrhage of this nature.

¹ See *ante*, p. 168.

² Murchison, *Continued Fevers*, pp. 336-7.

³ Buhl, *loc. cit.*, 68.

⁴ Buhl, Report of the Munich Commission on the Cholera Epidemic of 1854, p. 500.

⁵ A case of this nature was communicated to me by my friend and colleague, Mr. Berkeley Hill, when after an operation severe hæmatemesis occurred, for which after death no cause could be discovered. Sir W. Jenner informs me that he has seen similar instances. In relation to it may be recalled the observations of Rokitanski upon hemorrhage from the bowels after severe burns (*Path. Anat.*, iii. 200).

⁶ Dr. King Chambers, *Indigestions*, p. 190. Bamberger, *loc. cit.*, 245. Another is quoted by Henoch, i. 307. It is possible that, in some of these cases, laceration of the mucous membrane, without rupture of the other coats, may be the cause of such hemorrhage. An instance of this nature is recorded by Dr. Wilks, *Path. Anat.* 1857, p. 275. Laceration of the *mucous membrane* of the stomach from the dragging of an omental hernia is described by Rokitanski, *Path. Anat.*, iii. 162.

⁷ De la Granulie, p. 154.

⁸ A very remarkable case of this kind is, however, given by Sir T. Watson, *Prin. Pract. Phys.*, ii. 425, where vicarious menstruation recurred regularly, ceased with pregnancy and lactation, and returned after weaning. He quotes also from Mr. North two other fatal cases. Dr. Murchison has cited another of older date (1712), *Med.-Chir. Trans.*, xli. p. 46; and Henoch, *loc. cit.*, i. 57, has observed the same phenomenon coincidently with an acute swelling of the spleen, which disappeared after hemorrhage from the stomach and intestines.

In larger hemorrhages, when the blood is rapidly poured into the stomach and quickly ejected, it may be coagulated, and may retain its normal colour, or may be only slightly blackened by the gastric juice.

Blood more slowly effused is acted on by the gastric juice, which prevents its coagulation, and frequently dissolves the envelopes of the red corpuscles, so that under the microscope only flakes or granules of pigment may be discoverable. In other cases the corpuscles are shrivelled, and irregular in form and size. The colour of the blood is then changed to a rusty chocolate brown or coffee-ground tint, and it is sometimes of a tarry consistence. Sometimes the altered corpuscles and pigment granules sink to the bottom of the vessel, leaving a clear supernatant fluid.

The presence of the blood can, however, be generally recognized: for bile seldom loses its more characteristic tint, nor does it assume the coffee-ground appearance just described. Food stained by ferruginous medicines will sometimes present a similar appearance; but microscopic and, if need be, chemical examination will then suffice for its distinction.

Blood, however, effused from the stomach is not invariably vomited, but may pass into the intestines and be voided by stool (melæna).

Difficulties may, under such circumstances, arise in deciding from what portion of the canal the blood has proceeded. Independently of distinct evidence of local disease, this may not always be possible, since blood proceeding from the upper part of the intestines has usually the same characters when voided by stool as that derived from the stomach. Blood from the duodenum may also be regurgitated into the stomach, and be evacuated by vomiting.

Cruveilhier was of opinion that blood effused from the stomach retained its rusty tint throughout, while that originating from the intestines was of a more inky character; but this distinction is not always applicable. The chief means of distinction depends on the more or less intimate intermixture of the blood with the fecal matter, which diminishes in proportion as its source approaches the lower portion of the canal.¹ The existence of disease in the latter (ulcerations from tubercle, typhoid, dysentery, cancer, or the pres-

¹ Bamberger, loc. cit., 252.

ence of hemorrhoids) also facilitates the diagnosis. In some cases, as in disease of the liver, we must often remain in doubt, since this cause may give rise to hemorrhage from any part of the tract.

The characters of altered bile in the stools are to be distinguished by dilution with water. Blood under these circumstances gives a redder tint.¹ Bile pigment can sometimes be distinguished by nitric acid; but bile seldom produces either the tarry or rusty appearance derived from altered blood.

The blackening of the feces from ferruginous and other metallic preparations can usually be distinguished by the tint, and also by the history of the case.

The distinction between hemorrhage from the lungs and that from the stomach is not always easy. Difficulty may arise either when blood is vomited immediately after its effusion in the stomach, so as to escape changes from the gastric juice, or when that proceeding from the lungs has been swallowed, and subsequently vomited in an altered condition.

In some cases, also, of mitral disease, blood proceeding from the lungs has been known to present a "bistre" or sooty tint.² In exceptional instances there may also be a double fallacy in the expulsive act attending each condition, for hæmatemesis may sometimes give rise to cough, and hæmoptysis may occasionally excite vomiting. The criteria ordinarily laid down are, however, usually sufficient when a patient is under observation, though it is sometimes more difficult to draw positive conclusions from the history of past attacks.

Blood proceeding from the lungs is generally frothy, aerated, non-coagulated, florid in colour, and alkaline in reaction.

That derived from the stomach is either blackened and rusty, or it may be coagulated and altered externally. If it has been at all delayed in the viscus, and unless it is in excessive quantities, it is acid.

Hemorrhage from the lungs is preceded or attended by a sense of weight and oppression in the thorax, together with a sense of dyspnoea and tickling cough, or with a sense of bubbling in the chest. Tinged sputa often precede, and almost constantly follow the larger flow, and these are brought up by coughing, are frothy and aerated, and mixed with mucus or pus. It may be the first

¹ Bamberger, loc. cit., 251.

² Walshe, Diseases of the Lungs, 416.

symptom in a certain proportion of cases,¹ but physical examination of the lungs and heart will, almost without exception, disclose evidence of disease in these parts.

Hemorrhage from the stomach is seldom, if ever, the *first* symptom of disease of this organ. It has usually been preceded by dyspeptic symptoms, or in the vast majority of instances by pain, nausea, or vomiting. The attack is preceded by nausea, and the expulsive act is almost invariably distinctly one of vomiting; it is not followed by cough or bloody sputa. Examination of the abdomen will usually reveal gastric tenderness, or the signs of disease of the liver or spleen.

The diagnosis of the disorders of the stomach in which the hemorrhage originates must be determined by their distinguishing features, which have been previously considered.

THE SYMPTOMS of hemorrhage from the stomach have been already described (see Ulcer of the Stomach).

PROGNOSIS.—Severe hemorrhages from the stomach are occasionally directly fatal; the author's conviction is, that this is more frequently the case when they arise from cirrhosis of the liver than when originating from ulcer or cancer of the stomach. In the latter disorders, however, they contribute largely to a finally fatal result by the exhaustion and anæmia which they induce.

THE TREATMENT consists of rest and the administration of hæmostatics.

In some cases, when the hemorrhage proceeds from congestion through obstructed venous return, particularly when the cause resides in the liver, it is benefited by purgatives;² but these are strongly contraindicated in cases of ulcer and cancer. With the above exceptions, cold and astringents must be resorted to. Ice, in small pieces, may be sucked constantly. Turpentine, acetate of lead, tannic acid, the perchloride of iron, or alum, or the infusion of matico, may also be tried. My own experience leads me strongly to prefer the acetate of lead in the majority of cases.

When the hemorrhage is severe, the head must be kept low. Brandy may be administered by the rectum, or ether inhaled. If temporarily arrested, abstinence from food should be practised as

¹ Walshe, Diseases of the Lungs, 416.

² Sir T. Watson, loc. cit., ii. 435.

completely as possible for some time, and nutriment should only be given in a fluid form, in very small quantities, and cold, so as to avoid both the afflux of blood during the digestive act, and also all movement of the stomach.

VIII.

HYPERTROPHY OF THE WALLS OF THE STOMACH.

SYNONYMS.—Cirrhosis, Plastic Linitis (Brinton), Fibroid Induration (Handfield Jones), Sclerosis (Snellen).

Thickening of the coats of the stomach appears to be a rare disease, and one that is at present but little associated with any definite group of clinical symptoms. It is also one regarding which much confusion has existed, and on the nature of which some doubt still remains in the writings of pathologists.

Andral, who furnished the first systematic description of it,¹ confounded it with scirrhus induration; or, rather, he described that form of cancer in the stomach as consisting only of a thickening of the coats of the organ, induced by chronic inflammation—an opinion which has been further supported by Bruch.² Hypertrophy of the muscular coats is a common result of pyloric obstruction.³ Cases of general thickening to any extreme degree of the coats of the stomach, independently of such causes, though occasionally met with, are nevertheless of extreme rarity.

Thickening of the mucous membrane from chronic catarrh has been already described; but this condition does not usually invade the submucous tissue, nor is the muscular coat generally affected.

In the cases, however, described under this head, a general thickening of all the coats ensues, which, however, especially affects the muscular and submucous layers. In some cases this is found more particularly in the pyloric region, under which circumstances that orifice is usually considered narrowed. In other instances it implicates to a greater or less degree the whole of the organ.

In some cases the thickening has apparently resulted from ab-

¹ *Prec. Path. Anat.*

² *Zeitsch. Rat. Med.* 1849.

³ *Louis, Rech. Anat. Path.*, p. 121 et seq.

normal growth of fibrous tissue, which has indurated the coats, and caused wasting of the muscular substance, but in which no evidence of a cancerous nature has been found by microscopic examination.¹ Rokitsanski considers that this change may sometimes be the final result of suppurative inflammation in the submucous tissues.

The coats of the stomach may, under these circumstances, attain a thickness of an inch, or an inch and a half. The mucous membrane is thrown into folds, and in some cases has been found thinner than natural (Dr. H. Jones). The cavity of the stomach, in a case recorded by Dr. Hare, was much contracted, so as only to contain about four ounces of fluid.

The symptoms in the recorded cases have varied, and have been complicated with the presence of ascites (Dr. Wilks), and with recent peritoneal inflammation (Dr. Hare and Dr. Wilks); or, when the disease has been limited to the pylorus, with the signs of obstruction. Vomiting, which has sometimes been attended with the ejection of matter of coffee-ground appearance, has been noticed in some instances; and pain, but not of a severe kind, has usually been present. Gradual emaciation has also been observed. The cases have generally been chronic; in some instances proceeding to a fatal termination in two or three years. In some cases the stomach has formed a distinct tumour, perceptible through the parietes, but which has, however, been resonant on percussion (Louis and Dr. Hare).

The causes of this condition, independently of the observation of Rokitsanski, are very obscure, and, from its extreme rarity, the disorder must be considered at present to be one which presents features rather of pathological than of clinical interest.

The main features by which it can be pathologically distinguished from scirrhus of the stomach have been already alluded to. (See note 1, p. 236.)

¹ See a case of this kind reported by Dr. Hare and examined by Dr. Lionel Beale, *Path. Soc. Trans.*, iv. 129. Another case reported by Dr. Quain, but in more doubtful terms, is in the same volume. Another case is reported by Dr. Handfield Jones, *Stomach*, p. 121. A preparation of great hypertrophy of the muscular and subserous coats, with no history attached, is in the museum of University College. Four cases are also given by Dr. Hughes Bennett, *Cancerous and Canceroid Growths*; and another by Dr. Wilks, *Path. Soc. Trans.*, xlii. 83. In Dr. Wilks's case a similar change was found in the intestines. Two cases of the affection limited to the pylorus are recorded by Dr. Habershon, *Obs. Alim. Canal*, 1857, p. 99. Several cases are also recorded by Brand, *Ueber Stenosen des Pylorus*, *Diss. Inaug.*; Erlangen, 1851. Also a case by Snellen, *Canstatt's Jahresb.* 1856, iii. 302, where the disease followed an injury to the epigastric region and affected the whole stomach.

IX.

STRICTURE AND OBSTRUCTION OF THE CARDIAC
ORIFICE OF THE STOMACH.

SYNONYM.—Stenosis of the Cardia.

This affection is comparatively rare, except when caused by cancerous growths occluding or contracting the orifice. Simple spasm appears occasionally to cause temporary obstruction of this nature. It may, however, result from the cicatrices of simple ulcers, or of such as have been caused by swallowing corrosive poisons. Foreign bodies impacted at the cardiac orifice may, it is said, act as a cause.¹ Obstructions may also result from aneurismal or other tumours pressing on the œsophagus at any part of its course. The symptoms of such pressure are almost identical with those of occlusion from disease of the canal.

The primary effect of these obstructions is the regurgitation of food into the mouth. The secondary consequences are those of starvation, proceeding more or less rapidly according to the degree of obstruction present.

The regurgitation into the mouth of the food delayed at the cardia takes place by an act resembling vomiting. The characters of the food thus returned depend on the degree of obstruction, or on the amount of dilatation which the œsophagus has undergone.

When the obstruction is incomplete, fluids may pass when solids are returned. A degree of spasm, or sometimes of paralysis, is often combined with the mechanical obstacle, since the facility of swallowing varies at different periods; and a narrow tube can sometimes be passed through the obstruction, by which patients may be fed, when all the food appears to be regurgitated. When dilatation of the œsophagus has not ensued, the food is very quickly returned, almost unaltered, except by mastication. When, however, the increased calibre and diminished muscular powers of the œsophagus above the seat of the obstruction admit of its reten-

¹ Bamberger, *loc. cit.* The author desires to express his obligation to this writer for much of the systematized information contained in this and the ensuing section.

tion, it becomes changed by maceration, or it may undergo fermentation or putrescent changes, which give rise to offensive eructations, and the matters ejected are often covered or mixed with a quantity of tenacious mucus.

Pain is generally felt, especially during deglutition; it is commonly referred to the ensiform cartilage or mid-dorsal region. The pain is seldom very severe, except when ulceration is present. In the intervals of deglutition there is often a dull sense of uneasiness. In many cases the patients are distinctly conscious of the point where the passage of the food is arrested.

The passage of a bougie will almost certainly indicate the point of obstruction; but this should be cautiously practised, owing to the danger of laceration of the œsophagus. The appetite is unimpaired, and patients often suffer intensely from hunger and thirst. Emaciation proceeds *pari passu* with the degree of obstruction. Dropsy of the lower extremities supervenes in some cases. Hectic is occasionally observed.

The termination is almost invariably fatal, except in cases of simple cicatricial narrowing, where dilatation may sometimes be practised. Death finally ensues by asthenia, or by pneumonia, or gangrene of the lung, or by rupture of the œsophagus.

THE PATHOLOGY of these cases depends on the discovery of the cause. In most instances of cancerous obstruction of the orifice the obstruction is due to scirrhus. Higher in the œsophagus, epithelial cancers are an equally frequent cause.

The stomach, in the later stages of the disease, is often greatly diminished in size, so as not to exceed that of the intestines. No special alteration of its mucous membrane has been recorded.

THE DIAGNOSIS of the obstruction is usually easy. It is determined by the character of the food regurgitated, by the obstruction felt in swallowing, and by auscultation during the act of swallowing. The passage of the bougie serves to distinguish between the effects of organic stricture and of simple spasm, and also to determine the site of the obstruction. Percussion will occasionally ascertain the existence of dilatation of the œsophagus. The diagnosis of the cause of the obstruction must in a great measure depend upon the history of the case. Spasmodic obstruction is intermittent, and is almost invariably associated with the hysterical dia-

thesis. Simple cicatricial contractions are very rare, except when corrosive fluids have been swallowed. The regurgitation of blood or pus,¹ or in rarer cases the discrimination of cancer cells in the matters vomited, would indicate, in all probability, the malignant nature of the obstruction.

THE TREATMENT consists in administering food of nutritious properties in a liquid form. The fact that, in some cases, a tube can be passed, will suggest this mode of giving nourishment. Nutritive enemata may also be administered. Thirst may in some persons be allayed by baths. Opium is also of value in diminishing the sufferings of the patient; it may be given in small quantities, by the mouth, by enemata, and by the hypodermic method. Dilatation may in some cases be successful, when the stricture is clearly traceable to cicatricial contractions resulting from corrosive poisons. Dilatation by the bougie, bismuth, the valerianate of zinc, small doses of strychnine, bromide of ammonium, and iron, are useful in hysterical cases.

The attempt to relieve the patient by gastrotomy and the establishment of a gastric fistula has not hitherto proved successful, but it would appear on many accounts deserving of a trial; though in the majority of the cases which result from cancerous growths, the fatal termination could only be delayed by such a procedure.²

X.

STRICTURE AND OBSTRUCTION OF THE PYLORUS. DILATATION OF THE STOMACH.

Stenosis, Constriction, and Obstruction of the Pyloric Orifice are comparatively rare, independently of obstructions from cancers and other tumors of the mucous membrane, or from the cicatrices

¹ Dr. King Chambers: see *ante*, Vomiting.

² A successful case of gastrotomy, undertaken to remove from the stomach a bar of lead which had been swallowed, is recorded by Mr. Bell, *Med. Times and Gaz.*, March 31, 1860. Another for the removal of a knife is quoted by Mr. Gray, *Holmes Syst. Surg.*, ii. 338. In this article a tabular statement is given of the cases where this operation has been attempted.

resulting from the healing of ulcers, or sometimes from the effects of corrosive poisons.¹

Pyloric stenosis may, however, result from the induration of the submucous tissue described in a previous section, which may affect the stomach throughout, or may be limited to the pyloric ring. It appears also, occasionally, to result from hypertrophy of the muscular coats limited to this portion of the organ, a form of disease which, as stated by Dittrich, appears to occur with preponderating frequency in the earlier periods of life.²

Whether *spasm* can continue sufficiently long to produce any of the more serious symptoms resulting from organic disease must be regarded as very questionable.

Obstruction to the exit of food from the stomach may also arise from pressure upon the pyloric orifice or first part of the duodenum, by tumours originating externally to the organ. The most common of these are cancerous growths in the pancreas, in the lymphatics of the small omentum, and in the liver. Cancer of the gall-bladder has also been observed to produce this effect.³

THE SYMPTOMS are essentially those resulting from obstruction to the passage of food from the stomach, though varied by those of the other diseases in which the obstruction has its origin.

Vomiting is the most distinct and prominent of these. Its appearance is not necessarily indicative of absolute closure of the pylorus, for Bamberger has observed it to occur in cases where the orifice would still admit of the passage of the little finger.⁴ Its character and time of appearance, however, greatly depend on subsequent changes in the stomach, and especially on the degree of dilatation which the organ undergoes—a condition which, as it may occur (though rarely) independently of pyloric obstruction, requires a separate description.

DILATATION OF THE STOMACH.

Dilatation is a common and almost constant result of constriction of the pyloric orifice, unless this is counterbalanced by muscular hypertrophy. It may, however, result independently of any ob-

¹ Dr. Markham, Path. Soc. Trans., x. 160, relates a case of obstruction of the pylorus as a secondary effect of swallowing Burnet's fluid.

² Braud, loc. cit., p. 15.

³ Dr. Markham, Path. Soc. Trans., viii. 243.

⁴ Bamberger, loc. cit., 253.

struction to the pylorus, under certain circumstances, which deserve consideration. Thus—

(a) Weakened conditions of the muscular coats, arising from mal-nutrition or impaired innervation, are a very common cause of not inconsiderable dilatation of the stomach. Such conditions arise in the course of severe general diseases, such as fevers, or from local causes in case of peritoneal inflammation. They are also common in cases of hysteria, hypochondriasis, and in some diseases of the cerebro-spinal centres, and also in some instances when the probability of one or other of the latter class of causes having existed is rather a matter of inference than of positive proof.¹

(b) Paralysis of the muscular coat, limited to the pyloric portion and preventing the propulsion of food into the duodenum, has also been observed to cause secondary dilatation of the stomach.²

(c) In addition to these causes, obstruction of the duodenum, or even of the upper portion of the jejunum,³ has been followed by the same result. Excessive eating of vegetable food has been described as a cause by Dr. Hodgkin.⁴ Dislocation of the stomach and dragging of the viscus by omental hernias are mentioned as causes by Bamberger.

The SYMPTOMS of this condition are divisible into two classes: firstly, the evidence of the delay of the food for an unnatural period in the stomach; and, secondly, the physical signs resulting from the dilatation of the organ. It is only in comparatively rare cases that the dilatation, when proceeding from other causes than pyloric obstruction, is accompanied by the severer objective symp-

¹ See an interesting case of this class by Dr. Humby and Mr. Miller, *Path. Soc. Trans.*, iv. 137. The invasion of the disease was comparatively sudden. There was vomiting, and the patient died after eleven days' illness. She was seen by several physicians, among others by Sir T. Watson and Dr. Bright. The stomach reached to the pubes; the muscular coat had in some places given way, but no cause for the distension could be discovered. A somewhat similar case is recorded by Andral, *Clin. Méd.*, ii. 122. See also Dr. Peebles, *Edin. Monthly Journal*, 1840, vol. liv.

² As in a case by Andral, *Clin. Méd.*, ii. 117, where there was extensive ulceration of the pyloric region without obstruction, and yet extreme dilatation of the stomach. The same condition of dilatation was observed in another case, where, in conjunction with induration of the coats of the pylorus, the muscular coat was atrophied, but the pyloric opening maintained its natural size. In this case, also, there was dilatation. (*Ib.*, p. 115.) Traube, *Gesammelte Beiträge*, ii. 988, attributes such dilatation to destruction of the branches of the pneumogastric nerve.

³ Andral, *Clin. Méd.*, ii. p. 129.

⁴ *Lect. Serous and Mucous Memb.*, ii. 277.

toms, and, with a few exceptions, the description of these refers almost exclusively to this class.

The immediate result of the retardation in the propulsion of the food is the production of fermentative changes; which are evidenced both by the tympanitic distension of the organ, and by the matters vomited. The nature of the changes thus undergone by the food, and the products of these, have been already considered. The matters vomited are almost invariably frothy and acid, and in the scum on the surface *torulæ* and *sarcinæ* are commonly found.¹ The alterations in the food vary with the duration of its delay in the stomach; sometimes the last meal is retained, while previous ones are rejected—a difference probably due to the relatively greater fluidity of the latter. The amount vomited and the length of the intervals between the act also vary in proportion to the degree of obstruction of the pylorus, or to the extent of the dilatation, or of the paralysis of the muscular coats. The vomiting generally occurs at longer periods after eating than in most of the other diseases of the stomach, though sometimes the act is much delayed both in ulcer and in gastric catarrh. When, however, the dilatation or paralysis is extreme, days may elapse between the recurrences of this symptom, but under such circumstances enormous amounts of altered food may be ejected.

Bamberger remarks that the vomiting may cease if *complete* paralysis of the muscular coat should ensue.

Eructation and heartburn are often observed to precede the vomiting, and in some cases acidity, apparently resulting from hyper-secretion, has been noticed.²

The appetite is variable. It is sometimes considerable, or even excessive; but in some cases this is attributable to the vomiting. Emaciation is an almost constant result: the extent to which it proceeds depends on the amount of food retained and assimilated. Constipation is, as might be expected, nearly invariably present. Dropsical swellings of the lower extremities have been seen in some cases.

The physical signs are those of extreme distension of the stomach. The tympanitic note of the organ may be heard over the extent

¹ It would appear not improbable, that, in the cases recorded by Dr. Budd and Mr. Busk, when *sarcinæ* appeared without evidence of pyloric obstruction, but in consequence of injury, the cause of the fermentative action may have been due to a failure of the propulsive power of the stomach due to paralytic causes.

² Bamberger, *loc. cit.*

which it occupies, though sometimes, when food is present in its interior, the inferior portions may be dull on percussion, and the dullness may change in site with the position of the patient. The distension may be so great as to push the diaphragm upwards. The tympanic resonance may reach even to the fourth rib, displacing the heart's apex upwards and forwards. Sometimes the prominence formed by the distended stomach can be perceived by the hand in the epigastric, umbilical, or pubic regions, and the shape of the organ may sometimes be recognized by the smaller curvature being well defined; and in some cases, particularly when there is hypertrophy of the muscular coats, the movements of the organ can be distinctly felt, and may be excited by external stimulants. In some cases the obstructing tumour can be perceived at the pylorus, but this, for the reasons before stated, is not constant.

Auscultation sometimes gives a splashing sound on movement, which, Bamberger says, is one of the best signs of this form of dilatation. In other cases, during drinking, the fluid may be heard and felt by the patient to pass into the large cavity. The heart's sounds may be occasionally heard to consonate in the distended organ.

THE PATHOLOGY of this affection has been already alluded to under its etiology. The size attained by the stomach may sometimes be very considerable; it may fill the greater part of the abdominal cavity, and it may reach even to the pubes.¹ The chief point of further practical interest in these cases is the condition of the muscular coat. This may sometimes be thickened, and under such circumstances the affection is less injurious to health than when it is thinned, distended, and paralyzed.

DIAGNOSIS.—That of obstruction of the pyloric orifice independently of dilatation of the stomach, or of the discovery of a tumour, is surrounded by so many fallacies that certainty would appear to be almost unattainable. The only distinctive symptom is vomiting after food; and unless dilatation is so considerable as to allow of fermentation taking place, the act is seldom delayed to a period capable of enabling a distinction to be made between it

¹ This has been observed in cases of dilatation independent of obstruction.

and other diseases giving rise to this symptom; for in the female sex the distinction of such cases from hysterical vomiting would be excessively difficult, and it must be recollected that in either sex cancer may run its course without pain. The duration of the case may, however, assist in the diagnosis from cancer.

The discovery of a tumour or of induration in the pyloric region, associated with persistent vomiting, are the only data on which reliance can be placed. The existence of a tumour would raise a presumption that the disease was of a cancerous nature; but a positive diagnosis would scarcely be justified without the presence of some of the more distinctive signs of this disorder.

When dilatation is present, the combination of symptoms and physical signs above given (and which it is unnecessary to repeat) is sufficient for its recognition. Extreme meteoristic distension of the abdomen might be confounded with cases of dilatation not associated with pyloric obstruction, and where vomiting is not a prominent feature. The discrimination may then be made by the methods suggested by Bamberger, of auscultation during the swallowing of liquids, and by the passage of a sound into the cavity of the stomach, in addition to the results of percussion and the splashing sounds audible on succussion of the patient.

PROGNOSIS.—The course and termination of cases of dilatation of the stomach, depend very much upon its cause. Simple dilatations without obstructions have, however, proved fatal. When resulting from obstruction, the course of the disease is usually prolonged, though its duration is much influenced by the conditions of the obstruction. Obstructions arising from simple thickening or the cicatrization of ulcers have usually a slower progress than is observed in cases of cancer of the pylorus.

The possibility of the reopening of the pyloric ring by sloughing processes in the latter disease has been already alluded to. Bamberger has also seen a patient recover when the obstruction was, in all probability, due to the cicatrix of an ulcer.¹

TREATMENT.—The treatment of cases of obstruction of the pylorus can be only of a palliative nature.

One main indication is the administration of food in small quan

¹ Loc. cit., p. 236, note.

tities at frequently repeated intervals. It is also of extreme importance that the food given should be of such a nature that it can undergo its chief metamorphosis by the process of gastric digestion.¹ Hence protein substances, beef-tea, pounded meat, or, possibly, meat already digested, as suggested by Drs. Marcet and Pavy, should form the chief articles of diet. Milk should be used more sparingly. Starchy substances, which undergo acid fermentation, and oily food, should be as far as possible avoided. Nutrient enemata of beef-tea may be used with advantage. The administration of pepsine and hydrochloric acid with the food is also desirable.

Fermentation of the food associated with the vomiting of sarcinæ, which, if permitted to continue unchecked, greatly increases the distension of the stomach, and tends to weaken its muscular coats, may be greatly controlled by the administration of the alkaline sulphites and hyposulphites recommended by Sir W. Jenner.²

Creosote and carbolic acid are less useful in this respect; these remedies have appeared to me to be capable of delaying, in some cases, the normal gastric digestion.

Alkalies and antacids are useful in relieving the acidity resulting from the fermentative processes. The other indications for treatment must depend on the nature and character of the obstruction. The chief of these have been already given in the chapters on Ulcer and Cancer.

The indications for the treatment of *dilatation of the stomach occurring independently of pyloric obstruction* may be summarized as consisting in the avoidance of further distension, and in restoring the tone and contractility of its muscular fibres.

Large meals should be avoided, and the food, as in the other form of dilatation, should be digestible and easily assimilable. Fermentation is also to be controlled by the means above indicated;³ and carminatives, such as cajeput, aniseed, or chamomile, may sometimes give relief.

The use of strychnia, and the taking of ice in small quantities, are the methods chiefly to be relied on for the second indication.

¹ Kuhne has shown that when the pylorus is ligatured, the whole of the food, if suited to the condition of gastric digestion, may disappear from the stomach (Lehrb. der Phys. Chemie, p. 52). ² Med. Times and Gaz., Aug. 1851.

³ Dr. Budd narrates a case where a patient who had long suffered from the vomiting of sarcinæ, obtained great relief by taking large quantities of common salt (Stomach, p. 234).

Iron may also be used with advantage when anæmia is present. Cold douches to the abdomen or spine, and galvanism to the abdomen, would appear to be deserving of a trial.

In addition to these measures, Dr. Kussmaul, of Freiburg, has recently practised with success, in cases of this nature, a method based on the analogy afforded by the beneficial effects resulting from the complete evacuation of the paralyzed and distended urinary bladder, by means of the catheter. Dr. Kussmaul, however, remarks that a true paralysis of the muscular coats of the stomach does not exist in most cases of dilatation, and particularly in those resulting from pyloric obstruction, since in most of these the movements of the distended viscus can be both seen and felt through the abdominal parietes. The power of evacuating its contents is, however, lost; the passage through the pylorus, even when a considerable degree of patency is found *post mortem* to have existed at this orifice, being further impeded by the displacement, and possibly by the torsion, of the opening. Dr. Kussmaul proposes to evacuate the stomach by means of the stomach pump, whenever there is evidence of any considerable accumulation of food in its interior, and in particular when vomiting has commenced.¹ It would appear that even a frequent repetition of the act of vomiting may fail under these circumstances completely to evacuate the fermenting contents of the stomach, and that after it has taken place, a large quantity may still be removed artificially. After the complete evacuation has been effected, Dr. Kussmaul proposes to neutralize the acid mucus, still charged with products of fermentation, by washing the stomach out with Vichy water, and other remedies can thus be applied with a similar object, such as sulphurous acid, solutions of carbolic acid, or borax. Dr. Kussmaul has found this method practically curative in some cases, when from the symptoms present it appeared probable that the dilatation of the stomach resulted from a partial stricture of the pylorus succeeding an ulcer of this part. The muscular power appeared gradually to be restored when distension was thus prevented. The indication for the employment of this measure is considered by Dr. Kussmaul to be the return of vomiting or of regurgitation; but several days frequently elapsed before the ne-

¹ Ueber die Behandlung der Magen-Erweiterung durch eine neue Methode; Freiburg, 1869. The stomach pump employed is one invented by Dr. Wyman in America, and described by Dr. Bowditch, Amer. Journ. Med. Sciences, N. S., xxiii. 1852, p. 320.

cessity for their repetition occurred, the intervals gradually becoming longer in proportion as the muscular coats regained their tonicity. Cases of cancerous stricture were also in some measure relieved by this procedure. The prevention of the distension of the stomach appears to be aided by the application of an abdominal bandage beneath its lower border. Care in diet (of which milk and meat should form the principal ingredients) is necessary to avoid further distension.

XI.

SOFTENING.

SYNONYMS.—Post-mortem Softening of the Stomach, Self-digestion of the Stomach; Gastromalakia; Ramollissement de l'Estomac; Magen-Erweichung. *Var.* Ramollissement simple; R. pultacé; R. gélatiniforme.

Softening of the coats of the stomach has been already described as one of the results of recent inflammatory action. The condition produced by this process has been spoken of as being analogous to the softenings occurring under similar circumstances in other tissues, and the appearances which it presents have been defined as consisting of *swelling* and *increased opacity* of the membrane, together with a diminution of its consistence extending for a variable depth in its substance.

Other forms of softening are, however, met with, when the membrane is of a pulpy consistence, breaking under the slightest touch; but when, instead of being opaque, it is *transparent*, more or less *gelatinous* looking, and generally, although not invariably, thinner than natural.

The nature and causes of these conditions have been much disputed; and as the opinions held respecting their true character have exercised no inconsiderable influence on the pathology and diagnosis of the disorders of the stomach, it appears desirable to devote some consideration to their real significance and to their mode of origin.

Softening, thinning, and even absence, of considerable portions of the lining membrane of the stomach, had been noticed by Morgagni,¹ but the first attempt to explain these appearances was made by John Hunter,² who attributed such changes to the self-digestion of the stomach after death, which he regarded as resulting from the action of the gastric juice on its coats, and which he believed was prevented, during life by the influence of the vital principle. He confirmed his observations on the human subject by experiments on fishes, which shortly after received a further support from Spallanzani,³ who also observed that the digestion of food was continued after death. These observations were continued, and Hunter's views were confirmed by Adams,⁴ Allan Burns,⁵ Wilson Philip,⁶ Gairdner,⁷ and Carswell;⁸ and there is a considerable uniformity in their descriptions of the appearances observed, and which they attributed to the same cause.

Stomachs in this state present, usually at the fundus, a portion where the membrane is evidently thinner than natural, or is entirely absent over an area of variable extent, while for some distance around it is softened and pulpy. The transparency of the tissue is greatly increased, allowing the white submucous coat to appear through the membrane, while the colour varies with the quantity of blood contained in the part. If this is small, the coats of the stomach are of a bluish-white; if it is more considerable in amount, they are brownish or blackish. The vessels also may be seen of a blackened colour, ramifying through the affected area, and their blackened contents may often be expressed in drops from their eroded ends.

Occasionally, but not commonly, very early stages of this process are observed, when the superficial layers of the mucous membrane are separating in flakes, and are much softened but not wholly dissolved. The surface of the membrane may have, under such circumstances, a somewhat whiter and more opaque appearance, corresponding to the form described by Cruveilhier as the *Ramollissement pultacé*.

In some cases the membrane is uniformly affected; in other in-

¹ De Caus. et Sed. Morborum, Epist. xxv. 2, xliii. 22, lv. 2.

² Phil. Trans. 1772, republished in Obs. on certain Parts of the Animal Economy.

³ Expériences sur la Digestion, 1783, 264.

⁴ On Poisons.

⁵ Edin. Med. Surg. Journ. 1800, vol. vi.

⁶ On the Vital Functions, 1817.

⁷ Edin. Med. Surg. Journ. 1824.

⁸ Ibid., 1830.

stances, when the stomach is contracted, the softening affects only the prominent rugæ, leaving the intervening sulci unchanged. Occasionally, also, the coats of the stomach and of the intestines are found uniformly swollen, transparent, and jelly-like, having lost all trace of structure, and resembling albumen, or presenting appearances seen in tissues after the action of an acid.

The extent of surface over which the change in question may occur is variable, as is also its precise seat. The whole of the stomach has been found thus softened, but more usually the condition is limited to the fundus or posterior portions; while in other, but rarer, instances it is seen only in the pyloric region or on the anterior wall, while the parts above mentioned have escaped. Often the softened portion is found to be abruptly limited by a well-defined border; but in other cases it merges insensibly into the surrounding membrane.

The softening and erosion often proceed to perforation of some parts of the stomach, intestines, or œsophagus,¹ allowing their contents to escape into the abdominal or pleural cavities, and in such cases analogous effects have been produced on contiguous viscera, especially on the spleen, liver, kidneys, or lungs; and in the last-named organs the change may be produced either subsequently to that of the diaphragm, or directly by perforation of the œsophagus, in the latter of which cases the alteration is usually found in the left side of the thorax.

The edges of the perforation of the stomach ensuing in this manner are thin, ragged, eroded, transparent, and having an appearance (to use the words of Hunter) "very much like that kind of solution which fleshy parts undergo when half digested in the living stomach, or when acted on by a caustic alkali."

Other authorities have, however, maintained that the forms of softening now described may occur during life as the result of disease. The chief of these have been Jaeger,² Camerer,³ Cruveilhier,⁴ Louis,⁵ and Andral.⁶ The three first named of these authors,

¹ Wilkinson King, *Gay's Hosp. Rep.*, vii. 1842.

² Ueber die Erweichung des Magens: *Hufeland's Journal für prakt. Heilkunde*, 1811, 1813.

³ Versuch. über die Natur der krankhaften Magen-Erweichung, 1828.

⁴ Méd. Prat. éclairée par l'Anat. et Physiol. Path. 1821; *Anat. Path.*, Liv. x.

⁵ Du Ramollissement avec Amincissement de la Membrane Muqueuse Gastro-Intestinale, *Rech. Anat. Path.* 1826. De la Fièvre Typhoïde, 1841, 2d Edit., pp. 156, 157, 407. Phthisis, *Dr. Walshe's Trans. Syd. Soc. Ed.*, pp. 60, 189.

⁶ *Préc. Anat. Path.*, ii. 88; *Clin. Méd.*, ii.

and also Billard,¹ attributed to these supposed pathological conditions a definite set of symptoms, which are said to be met with in greatest frequency among children, but are stated to occur also occasionally among adults. Their leading characteristics are enumerated as violent fever, a semi-comatose condition, interrupted by restlessness, cries, and great irritability of temper, intense thirst, pain in the abdomen, frequent uncontrollable vomiting, diarrhoea, with grass-green stools, and early collapse, followed by death in a few hours, or in the course of a few days. It appears possible, however, from an observation of Ziemssen's, that under conditions involving the unduly long retention of the contents of the stomach in its interior in an acid condition, this effect may even be produced during life.²

There has been, however, a wide diversity of opinion among these authors respecting the nature of these changes, and every shade of appearance has been described as presenting a distinct pathological character, while the significance of each of these has, in almost every instance, received a different interpretation from those who have opposed the views of Hunter and Carswell.

Thus Jaeger and Camerer attributed them to disturbances in the nutrition of the stomach, induced by impaired innervation.³ Andral, while recognizing as inflammatory the form of softening usually attributed to that process, described the appearances now under consideration as resulting from a vital change, non-inflammatory in its nature, and analogous to the softenings which occur in the cornea under conditions of impaired nutrition. Louis, on the other hand, regarded as inflammatory the softening which Carswell had ascribed to the action of the gastric juice; but described also a form of "simple softening," which he attributed to cadaveric change. Cruveilhier again distinguished two forms: the "*Ramollissement pultacé*" and the "*Ramollissement gélatineux*;" the former being, according to him, of post-mortem origin, while the latter is caused by a vital change, "specific" in its nature,

¹ *Maladies des Enfants*, 1828.

² See p. 273.

³ An opinion still maintained by Rokitsanski, *Path. Anat.*, iii. 179. This distinguished pathologist states that precisely identical appearances may be produced in the stomach by changes ensuing before and after death. He says that the softenings of the stomach met with in cases of brain disease and in the acute febrile and inflammatory diseases, are effected during life in consequence of disturbed innervation. It would appear, however, to the author, for the reasons hereafter to be stated, that the post-mortem nature of these changes is the more tenable hypothesis, though the softening thus found may be due to and may indicate perverted conditions of secretion existing during life.

and due neither to inflammation nor to gangrene, and to which he attributed the symptoms above described as characteristic of this variety.

Recent researches have, however, tended to confirm Hunter's opinion, and to show that the forms of softening described by Louis, Jaeger, Camerer, and Cruveilhier, and also the second form of Andral, are all to be ascribed to variations occurring in the same process of solution by the gastric juice. Cruveilhier's arguments against this view deserve, however, to be recapitulated, since they express most of the difficulties which have beset the adoption of this explanation of all the forms now under consideration; and it is chiefly to the elucidation of these that modern observation has been directed. He stated that the theory of Hunter and Carswell was inapplicable to cases when the cesophagus, or the anterior wall of the stomach, was affected (the body having been placed after death in a recumbent posture); that the softening is sometimes found when the stomach is empty;¹ that it can only be artificially produced by a much larger amount of acid than is found *post mortem* in the stomach, and that the softening of the intestines, whose contents are normally alkaline, cannot be produced by the action of an acid.

In relation to these difficulties it may, however, be stated—

(a) That, as shown by the observations of Dr. Gairdner, which have been confirmed by numerous subsequent observers, both forms of softening described by Cruveilhier have been found *post mortem*, unpreceded by any of the symptoms described by him and Camerer and Jaeger as characteristic of the supposed disease.

(b) The appearances thus described can be artificially produced at will, after death, in a previously healthy stomach in any part which is most dependent.²

(c) The observations of Brücke³ and Bernard⁴ have shown that for some time after death a substance continues to be formed in the gastric follicles, having all the properties of the gastric juice; and that the acid reaction, which during life is normally only found

¹ For a confirmation of this statement see an experiment by Dr. Blundell, quoted by Dr. Hodgkin, *Morbid Anatomy of Mucous and Serous Membranes*, ii. 309; where a dog which had been maintained for weeks without food, by means of the injection of blood into his veins, was nevertheless found to have softening of the stomach after death.

² Burns, Carswell, Camerer; also Williamson, *Dublin Journal*, vol. xix. 1841.

³ *Sitzungsbericht der Akad. der Wiss. zu Wien*, xxxvii. 165.

⁴ *Liq. de l'Organisme*, ii. 377.

upon the surface of the mucous membrane, may within a few hours after death extend through its whole thickness. As also the gastric juice is normally formed in greater quantities in the cardiac than in the pyloric half of the stomach, the observations of Dr. Wilkinson King¹ concerning the greater acidity of this part when the stomach has been found so softened receive a further confirmation.

(d) Elsaesser's² observations further show that fermentescible substances, whether milk or those belonging to the amylaceous series, undergo, not only during life, but also after death, an acid fermentation, and become capable of producing the phenomena of softening, both simple and gelatiniform, not only in the stomach, but also in the intestines; and that when these changes have occurred in the latter organs, their contents have been found to present an acid reaction.

These fermentative processes may originate in imperfect digestion, to which infants are so liable. They are, however, most easily excited through the catalytic effects of the mucus produced by catarrhal inflammation. When present, they also tend to cause the acuter forms of gastro-intestinal catarrh, the symptoms of which correspond very closely with the disorders which have been described as symptomatic of these changes in the mucous membrane, but which are really only the consequences of the inflammation thus set up. The softening, on the other hand, is on this hypothesis believed not to occur during life, but to be the result of the *post-mortem* action of the acids thus generated upon the coats of the stomach.³

(e) It remains to be shown why the condition is present in some cases and not in others; and perhaps among the most important of the former class must be reckoned those cases in which the membrane has been found softened, while the stomach is empty, as has been observed by Blundell, Cruveilhier, and Dr. Budd.⁴ It is to elucidate these cases that Brücke's and Bernard's observations, before quoted, give the most satisfactory clue; and to these must be added the possibility, brought forward both by Dr. Budd and Virchow,⁵ that in many other diseases there is a tendency to a perverted

¹ Guy's Hosp. Rep. 1842, vol. vii., and 2d Ser., vols. i. iv.

² Die Magen-Erweichung der Säuglinge, 1846.

³ See, in support of this view, Virchow, Würzburg Verhandl., i. 296; Archiv Path. Anat., v. 359.

⁴ A remarkable instance of this kind is given by Dr. Budd, On the Stomach, 1855, pp. 16, 17.

⁵ Würzburg Verhandl., loc. cit.

secretion of the stomach, which probably exercises a peculiarly corrosive influence after death; though, as Virchow¹ has remarked (and his observations are supported by Camerer), the most irritating secretions formed during life appear to have no influence in producing this effect so long as vitality persists.²

(f) The frequent absence of these softenings has been fully explained by Drs. Budd³ and Pavy⁴ to be due to the alkaline reaction of the blood, neutralizing the acidity of the gastric juice, and also to the proportion borne between the amount of this fluid in the vessels and the acid reaction of the contents of the stomach. Immunity of the posterior wall, while the anterior portion has been affected, has further been explained by the former author to depend on the gravitation of the blood to this part of the stomach; or, as in a case reported by Burns, on the presence of an alkaline dropsical fluid in the cavity of the abdomen.

(g) The process of softening appears to be only slightly influenced by external temperature⁵—a fact explicable by the observations of Nasse⁶ and Elsaesser,⁷ that the cooling of the internal organs of the body is not so rapid during colder seasons as might *a priori* be supposed; and their temperature often remains sufficiently elevated during a period adequate for the production, by self-digestion, of the appearances described.

(h) Lastly, when food is contained in the stomach, the effects of the fluid chyme on its coats may be influenced both by the amount and by the nature of the food. It has been long known that the gastric juice is only sufficient for the digestion of a certain amount of food,⁸ and, therefore, if this be in excess of the powers of the solvent, its action cannot be exerted on the containing organ; while, on the other hand, as pointed out by Dr. Brinton,⁹ amylaceous matters, which neutralize less of the gastric juice than albuminoid materials, tend, not only directly by their fermentation (to which allusion has already been made), but also indirectly, by exciting the secretion of an acid fluid, to give rise to this solvent action. Further, as has been stated by Dr. Budd, medicinal sub-

¹ Archiv, vol. v. p. 360.

² It now, however, appears to be probable that this may occasionally occur. See Ulcer, Etiology, also p. 273.

³ Croonian Lectures, Medical Gazette, 1847; and Diseases of Stomach, 1855.

⁴ Phil. Trans. 1863. Treatise on Digestion, 1867.

⁵ Elsaesser, loc. cit. 51.

⁶ Untersuch. zur Phys. Path. 1835.

⁷ Loc. cit. p. 69.

⁸ For further and exact confirmation of this fact, see Brücke, Sitzber. Wiener Akad. 1859

⁹ Diseases of the Stomach, p. 80.

stances, and especially alcohol, given shortly before death, may in many cases more or less completely prevent this chemical dissolution.

From the considerations above quoted, it therefore appears that in almost all cases, with the exception of the rare instances before quoted, the changes in the stomach now described must be regarded as the result of post-mortem effects of a purely chemical nature; but that, in a certain number of instances, morbid conditions of the stomach, which tend either to cause an increased secretion of the gastric juice, or to set up fermentative changes in the food (especially when this consists of milk or amylaceous substances), may favour this action. It is, however, one that only very rarely occurs to any appreciable extent until after life has ceased to exist, and the appearances so produced cannot therefore in the majority of cases be regarded as anatomical or pathological conditions to which any of the symptoms occurring during life can, with justice, be attributed.

It seems tolerably certain that these softenings are not identical with those produced by putrefactive changes in other tissues of the body, though these undoubtedly aid in increasing the degree of softness of the membrane. It is not indeed, in all circumstances, easy to discriminate the exact share attributable severally to each of these processes—which must be, to some degree, determined by the amount of cadaveric change observed in other parts. One of the most marked evidences of the latter, though not, comparatively, very frequent, is an emphysematous condition of the coats, arising from the development of gas through putrefaction in the submucous tissue.

It has been already stated that the inhibition of the mucous membrane with hæmatin may occur very early after death, and is due probably to both causes acting conjointly; but the blackened appearance of the blood in the vessels, though partly due to the action of the gases of the gastro-intestinal canal, is, in a great measure, the result of the action of the gastric juice, as has also been explained in previous sections.

XII.

PERFORATION OF THE STOMACH.

PERFORATION from within, formerly described as an independent disease, has received no recent trustworthy confirmation. The cases in which it has been described are now almost universally admitted to have resulted from ulcerative processes, or to have arisen from post-mortem softening. The modes of distinguishing these conditions have been already described (see Ulcer). Cases of perforation, due to foreign bodies in its interior, are, however, occasionally met with.¹ An interesting case of perforation of the stomach, caused by an abscess of the liver, which communicated simultaneously with the pericardium, is recorded by Dr. Graves.²

XIII.

RUPTURE OF THE STOMACH.

RUPTURE has only, with the exception of the rarest instances, been authentically established in cases of external injury. Ziemsen has, however, seen rupture follow distension through fermentative processes in a stomach which was the seat of stricture arising from the healing of a chronic ulcer.³ The symptoms have been those of collapse, followed by peritonitis.⁴ The occurrence is most likely to happen when the stomach is distended by food at the time of the injury. Whether a fatty degeneration of the muscular coat of the organ may occasion the spontaneous occurrence of this event must remain a subject for further inquiry.

¹ See a case by Drs. Quain and Bucknill, of perforation of the stomach by a mass of cocoa fibre, swallowed by a lunatic, *Path. Soc. Trans.* vol. v. Another, of perforation of the duodenum in a lunatic who swallowed spoon-handles and nails, has been recorded by Mr. Poland, quoted by Mr. Pollock, *Holmes' Sys. Surg.* ii. 470.

² *Clin. Med.*, ii. 236.

³ *Sammlung klinischer Vorträge* (Volkmann), No. xv. p. 100.

⁴ A case of this kind occurring after a fall is recorded by Mr. Moore, *Lond. Med. Rev.* July, 1860. A case is also given by Richerand, *Physiol.* i. 282, of a woman in whom, after an external injury, a fistula subsequently formed, quoted by Dr. Pollock, *Holmes' Surgery*, ii.

XIV.

TUBERCLE OF THE STOMACH.

THIS must be regarded as an exceptionally rare disease. Andral¹ says that he only met with it twice. Willigk² only found it five times in 1317 cases. In 141 cases of tubercle in the gastro-intestinal canal, Barthez and Rilliet³ found the stomach affected in 21. These authors state that its seat is ordinarily in the great curvature, and that in this situation it may sometimes give rise to extensive ulcerations, which may attain the diameter of a five franc piece.⁴

The author has never seen this disease commencing in the mucous membrane, but he has found a perforation of the stomach caused by tubercles commencing in the peritoneum, passing from without inwards through its coats, and thus following the tendency, observed by Barthez and Rilliet,⁵ of tubercles seated on the peritoneal surface of other parts of the canal.

It may possibly be questioned whether the follicular ulcerations of the stomach, so common in phthisis, may not be due to the solitary glands undergoing changes similar to those seen in other portions of the intestine, but the author has not been able to obtain any positive proof of the identity of the process in these parts.

Perforation of the stomach by a tubercular ulcer, commencing in the submucous tissue of the great curvature, and attended by copious hæmatemesis, resulting from the invasion of the gastro-epiploic artery, has been recorded by Bignon.⁶ Tubercles existed around this ulceration.

In the majority of cases recorded, no symptoms have been observed. In three only of the cases recorded by Barthez and Rilliet was vomiting present. The disease, in the present state of our knowledge, offers no distinctive features for either diagnosis or treatment.

¹ *Proc. Path. Anat.*, ii. 178.

² *Prager Viertel-Jahresch.*, vol. i. p. 80.

³ *Malad. des Enfants*, iii. 183.

⁴ See also Weissbach, *Canstatt's Jahresb.* 1844, iv. 203. Also Valentin, *Virchow's Archiv*, xlv. p. 306. The latter author distinctly traced tubercular ulceration in the stomach associated with granulations. He questions whether the granulations of tubercle were not secondary to the ulcer of the stomach. Steiner and Neuretter, *Prager Viertel-Jahresch.* 1865, vol. ii., have also seen this.

⁵ *Loo. cit.* 780.

⁶ *Gaz. des Hôpitaux*, 1853, p. 111.

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